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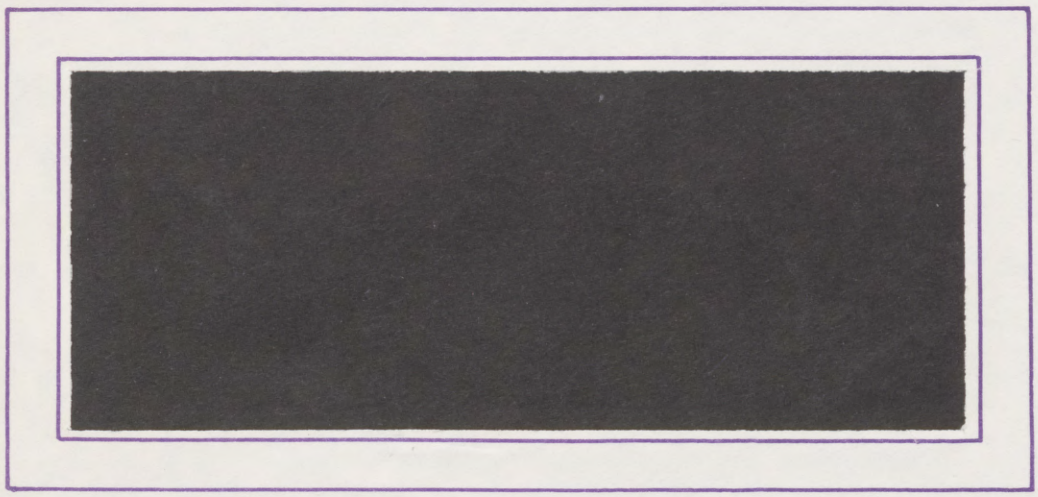

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THE EFFECTIVENESS OF GOVERNMENT POLICIES TO ALLEVIATE AGRICULTURAL DISTRESS, 1925-1939

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March 1986 RP-94

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ABSTRACT

Farm failures rates in the U.S. reached historic heights in the inter-war years. We estimate the dynamic relationship between farm earnings and farm failures and assess the effectiveness of government intervention -- state farm foreclosure moratoria, an expanded federal role in farm mortgage lending, and the programs instituted under the Agricultural Adjustment Act and its successor. Our empirical results indicate that the influence of past earnings on farm failures is important and complex. Our counter-factual estimates of a world without government programs suggest that government intervention may have saved as many as one million farms from failure.

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Farm failure rates have risen steadily during recent years. With the exception of failure rates during the Great Depression years, current rates exceed those of any other period during this century. What determines farm failure rates? How long does it take for the full effects of the different factors to be felt? Can intervention by the government influence failure rates? If so, what type of intervention is the most effective?

Answers to these questions might normally be sought through empirical analysis of the agricultural real estate market in recent years. Unfortunately, the data required to conduct such a study of the current period of distress are no longer being collected at any aggregate levels. But all is not lost. This is not the first time in recent history that agriculture has suffered unusually high failure rates. During the 1920s and 1930s commodity prices and earnings suffered two distinct precipitous falls. As a result, farms failed during those two decades at rates that have not been approached either before or since.

The interwar period witnessed extensive intervention into agricultural mortgage markets as state legislatures and the federal government attempted to alleviate farm mortgage distress. An examination of this period provides information of value for determining the effectiveness of policies currently under consideration. Reported below are estimates of the effects on farm failure rates of (1) the programs of the Agricultural Adjustment Administration, (2) the changing role of the federal government in the agricultural credit market, and (3) moratorium legislation passed by twenty-five states in the early 1930's.[1] The estimates indicate that each of the programs was

[1] Our analysis provides estimates of consequences of these state legislated moratoria that were not measured in Alston (1984).

important in reducing farm failures and that in total they may have saved as many as one million farms from failing.

In previous studies of factors affecting farm failure rates, Shepard and Collins (1982) and Alston (1983) used time-series and cross-sectional data respectively to estimate static regression equations. The present study uses results obtained by Alston (1983) on the determinants of cross-sectional differences in farm failures during the 1920s and 1930s and extends his model to examine the effects of government relief programs and the dynamics of the farm failure process. Three intuitively plausible explanations of why the farm failure process is dynamic are discussed below. Estimation results indicate that the dynamics are important and complex. The pooled time series-cross sectional data used in the empirical analysis are from the 48 contiguous states for the period 1925-1939.

I. Farm Failures during the Interwar Period

The period between the World Wars witnessed one of the most marked booms in land values and two of the most severe agricultural depressions of this century. Table 1 shows how U.S. farm failure rates and several related variables changed during the period 1913-1939.[2] From 1913 to 1920 the annual rate of farm failure was about three per thousand. It rose to over 18 in the late 1920s, skyrocketed to almost 39 in 1932, and then fell to less than 13 by 1940.[3] Failures throughout the interwar period often resulted from the inability of farmers to meet payments fixed during times of prosperity, combined with the desire of lenders to protect the principal of loans in the face of declining land values. Farm earnings and levels of mortgage debt influenced the ability of farmers to meet mortgage payments and therefore the rate at which farms failed.

Net farm earnings depend on commodity and input prices and yields. The substantial declines in agricultural earnings during the interwar period resulted mainly from changes in agricultural commodity prices.[4] Columns (2)-(4) in Table 1 indicate that between 1914 and 1920 commodity prices and net farm incomes more than doubled. Rapidly rising land values and mortgage debt

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[2]Throughout this paper, the term "farm failures" denotes legal foreclosures, loss of farm as a result of bankruptcy, loss of title by default of contract, sales to avoid foreclosures, and surrender of title or other transfers to avoid foreclosure. This is the definition employed in the USDA publications that were the sources of these data.

[3]The average failure rate since 1940 has been: 1941-1950, 3.2; 1951-1960, 1.7; 1961-1970, 1.3; 1971-1980, 1.3. See Alston (1983) for the sources of these figures.

[4]Jones and Durand (1954).

suggest that many farmers and creditors expected the high net income levels to continue.[5]

Optimism about the duration of the high postwar levels of farm income proved to be ill founded. Partly because of an unexpectedly rapid recovery by European agriculture, demand for U.S. agricultural commodities fell, and farm prices and incomes plummeted during 1920 and 1921. Concurrent decreases in production costs only partially offset the fall in prices received. Although prices and incomes recovered somewhat after 1921, they did not approach the high levels of the immediate postwar years during the 1920s or the 1930s. Like commodity prices and incomes, the prices of farmland also plummeted during the early 1920s. However, unlike commodity prices and incomes, which increased slightly after 1923, the value of farmland continued to fall throughout the 1920s.

Farm mortgage debt lagged behind prices and incomes. While prices and incomes declined in 1920 and 1921, mortgage debt continued to increase until 1923. The continued rise resulted from completions of transactions initiated prior to the 1920 price decline and from refinancing loans that had originally been negotiated without farmland as security during the boom years 1917-1920.[6] By 1923, the factors reducing mortgage debt (liquidation through foreclosures and other distress-related transfers) outweighed the factors increasing it, and

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[5] See Johnson (p. 178 and p. 181, footnote 4) for sources of contemporary comments supporting the mistaken view that the favorable prices and income levels would continue.

[6] For a discussion of the significant changes in the composition of the mortgage debt during this period, see USDA, Horton et al. (1942, p. 3). That many farmers were able to obtain short-term distress loans during the period of depressed income, rather than being foreclosed or declaring bankruptcy immediately, can be interpreted as an indication that at least some lenders and borrowers viewed the reduced prices and incomes as temporary. Woodruff (1937, p. 32) indicated that such optimism did exist.

mortgage debt began a decline that continued for the remainder of the 1920s and through the 1930s.

The relative stability of commodity prices and farm incomes from 1923 to 1929 was upset during the early 1930s. By 1932, prices and farm incomes had fallen to less than half of their levels in 1929. Recovery came slowly after 1932. Even with the aid of a variety of government programs designed to boost prices and incomes, net farm income in the second half of the thirties remained below its level in the late twenties. Land values, which fell gradually during the 1920s, plummeted between 1930 and 1933. Although values increased after 1933, they did not regain their pre-1930 levels until the middle of the 1940s.

Considerable interregional differences existed. Failure rates at the depths of the Great Depression in 1933 ranged from 7 per thousand in Connecticut to 78 in South Dakota. The Great Plains and Rocky Mountain states generally suffered more severe distress (as indicated by failure rates) than other states throughout the interwar period. Interregional differences in farm failures were influenced by the considerable variance in price changes across farm products. Prices of grains, cotton, and livestock fell the most, while prices of dairy products, fruits, and poultry products fell relatively less.

Federal and State Action to Alleviate Farm Distress

Federal and state governments acted in three major ways to reduce farm failures during the interwar period: 1) the Agricultural Adjustment Administaration attempted to stabilize prices and increase earnings; 2) federal credit

agencies increased their lending; and 3) many states imposed moratoria on farm foreclosures.[7]

The Agricultural Adjustment Act (AAA) became law on May 12, 1933.[8] The AAA and its successor -- the Soil Conservation and Domestic Allotment Act -- were designed to stabilize prices and increase earnings. At the outset policy-makers were most concerned with increasing farm incomes. They hoped to accomplish this goal by inducing farmers to reduce acreage in crops and the number of livestock. Income would rise as a result of reductions in supply and government benefit payments for acreage reductions.

How successful was the AAA in meeting its goals? The results appear to have been mixed. Prices and incomes rose after 1933 but not up to 1910-1914 levels -- the goal of many in the AAA. In fact, except for beef cattle prices, agricultural prices during the 1930s did not reach the levels of August 1929. Relative to August 1929 levels, prices in August 1939 were 59 percent for corn, 66 percent for cotton, 50 percent for wheat, 59 percent for butterfat, 60 percent for hogs, 93 percent for chickens, and 49 percent for eggs.[9]

Of course incomes, not prices, are most germane to the prevention of farm failures. Like prices, incomes did not reach the levels of the late 1920s.

[7]Other New Deal programs such as the Farm Security Administration (FSA), Works Progress Administration (WPA) and Civilian Conservation Corps (CCC) directly or indirectly affected farm distress. The FSA was designed to help farmers on the lowest rungs of the agricultural ladder and hence its impact on farm failure was minimal. The WPA and CCC increased the off-farm earnings of farmers and thereby enabled some farmers to retain their farms. Despite these recognized effects, the overall impact of these programs on failures was slight. We will not further discuss them or attempt to assess their influence.

[8]A thorough historical treatment of the Agricultural Adjustment Act appears in Saloutos (1982).

[9]Saloutos (p. 256).

Nevertheless, to the extent that the AAA increased earnings relative to what they otherwise would have been, it played a positive role in alleviating farm distress -- at least in the short run. Nourse, Davis and Black (1937, p. 323) estimated that for the first three years of the AAA, the commodity programs increased farmers' incomes by $1.8-2.0 billion.[10] Benedict and Stine (1956) assessed the impact on gross cash farm income attributable to the various AAA commodity programs and found that the effects varied considerably across crops. These authors found that substantial gains in incomes resulted from the cotton and tobacco programs, that the corn and livestock programs were moderately effective, and that the effects of the wheat program were negligible.[11]

During the interwar period the federal government became involved directly in farm mortgage markets.[12] In 1916 Congress passed the Federal Farm Loan Act, which created the joint stock and the federal land banks. The joint stock land banks soon encountered financial difficulties -- primarily because they were not diversified temporally -- and the process for their liquidation was set forth in the Emergency Farm Mortgage Act of 1933.

The relative importance of the federal land banks in agricultural credit markets increased through the interwar years. In the early twenties, when many small private creditors experienced financial difficulties, and again after early 1933, they markedly increased their lending. The initially stated purpose of federal land banks was to make credit available to regions not served by many lenders. With the advent of the Roosevelt administration, they

[10]The authors indicated that these figures should be reduced by 10 to 25 percent to account for food and commodity purchases by farmers.

[11]Benedict and Stine (1956, pp. xxiv, xxix, 16 and 109).

[12]The most comprehensive review of farm mortgage markets for the interwar period is contained in USDA, Horton et al. (1942).

became the principal agency for alleviating farm credit problems. With funding from the U.S. Treasury, they refinanced private loans, reduced the principal on some mortgages, decreased contract interest rates retroactively and refrained from foreclosing as long as possible. The federal land banks and Land Bank Commissioner -- the latter established to lend to farmers in severe financial distress -- increased their combined holdings of farm mortgage debt from 13 percent of the total in 1933 to 37 percent in 1940.[13]

Just as the role of the federal government in the farm credit market varied over time, so too did it vary regionally.[14] Consistent with its initial goal in the 1920s to make credit more readily available, the federal land banks concentrated their activities in the southern, western and mountain states. Following 1933 their intention was to increase their involvement the most in the states suffering the most severe farm distress.

How effective were the efforts of federal lending agencies in alleviating distress? Before 1933 they did not explicitly try to reduce farm failures through their participation in the farm credit markets. Certainly joint stock land banks, which were private institutions, foreclosed when it was profitable to do so. In the 1920s federal land banks may indirectly have reduced the rate of farm failures by writing mortgages with longer pay-back periods than those of other lenders. After 1933, it appears that the government reduced the rate of farm failures. What is less clear is whether failures were simply postponed.

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[13]Calculated from USDA, Horton et al.(1942 p. 222).

[14]In 1939, for example, federal land bank and Land Bank Commissioner loans contributed 58% of the total farm mortgage lending in North Dakota, but only 16% in Delaware. See USDA, Horton et al. (1942, Figure 9, p. 17).

In addition to the efforts of the federal government, many state governments acted to stem the tide of failures. The intended panacea for ailing farm credit markets enacted by twenty-five state legislatures was a moratorium on farm foreclosures. These laws allowed delinquent debtors to retain title to mortgaged land for pre-determined or court-determined periods. The allowable reprieve to debtors varied considerably across states, ranging from three months to almost four years.[15] Some states extended their moratoria upon expiration of the initial legislation.

Although scholars have examined the legal importance and some of the economic consequences on private credit markets of the state moratoria,[16] the extent to which the moratoria achieved their goal of preventing failures has not been determined. Legislators hoped that earnings would rise sufficiently over the moratorium period to enable debtors to make past-due mortgage payments and avert foreclosure. In some instances the legislation was superfluous because many creditors were already being extremely lenient.[17] In addition the legislation did not prevent voluntary foreclosures in which the debtor sur-

[15] U.S. Congress, Central Housing Committee (1936, Appendix No. I).

[16] For a recent assessment of the legal importance of the state moratoria, in particular the Supreme Court ruling in 1934 in Home Building and Loan Association v. Blaisdell, et al. (popularly known as the Minnesota Moratorium Case), see Epstein (1981). For an analysis of the impact of the moratoria on interest rates in private mortgage loans and on the number of private mortgage loans, see Alston (1984).

[17] Woodruff (1937) argues that by the time the state moratoria went into effect the foreclosure policies of large insurance companies and the federal land banks were very lenient. Unfortunately, little information exists about the foreclosure policies of smaller private credit institutions and private individuals. These two groups of creditors (who still held 60 percent of the outstanding mortgage debt [see USDA, Horton et al., p. 22]) may have been less likely to defer foreclosures than large institutions because of less access to capital. For many individuals -- e.g., retired farmers -- mortgage payments were the sole source of income.

rendered the mortgaged land to the creditor without going through a formal foreclosure procedure. A farmer might have opted for a voluntary foreclosure if he did not expect income to increase sufficiently in the future to meet his debt obligations. Perhaps, also, state moratoria simply postponed the day of reckoning. Upon expiration of the moratorium, if earnings had not risen sufficiently, creditors would foreclose loans they otherwise would have foreclosed earlier.

II. A Model of Farm Failure Frequency

Lenders' decisions to make mortgage loans depend on their expectations of borrowers' future payments. The stock of mortgages changes when new mortgages are negotiated faster or slower than current mortgages are terminated. Mortgages can terminate as scheduled in the original contract or as a result of failure of the mortgagor to meet scheduled payments. Failure to make payments that leads to bankruptcy or foreclosure is our concern.

When a borrower and a lender negotiate the terms of a mortgage agreement, there is uncertainty concerning the future ability of the borrower to meet his scheduled mortgage payments. The uncertainty results from imperfect information about the productivity of the borrower and from the randomness of agricultural incomes. As time passes, a borrower's actual ability to meet his payments will be determined by his ability to farm and by conditions beyond his control such as commodity prices, costs of inputs, effects of weather and insects on yield, and personal factors unique to individual farmers - machinery breakdowns, illness, and so forth.

During any period, the viability of a mortgage contract depends on borrowers' and lenders' perceptions of the discounted expected net benefits of terminating the contract. If payments on a particular loan are delinquent, the lender must decide whether to grant an extension or foreclose. If he forecloses, he benefits by replacing the current delinquent loan with new loans, thereby improving the status of his loan portfolio. The magnitude of these benefits depends on differences in the expected abilities to pay of current and prospective new borrowers, differences in interest rates on old and new loans, and the improvement in protection of the lender's principal. These gains must

be weighed against the costs of initiating foreclosure proceedings, reappraising land values, conducting an auction, and rearranging his loan portfolio.[18]

In addition to these direct benefits and costs, foreclosures also affect the reputational capital of the lender in two different ways. First, a lender's "goodwill" reputational capital may influence a prospective borrower's choice of a lender. Extensive foreclosures by a particular lender may significantly diminish his goodwill capital, especially if many debtors are suffering because of events beyond their control. On the other hand, foreclosing on a delinquent debtor lets others know that delinquency will not be tolerated and therefore reduces the lender's monitoring costs.

For a given lender, differences in the circumstances of individual borrowers give rise to differences across loans in the benefits and costs of foreclosing. Let F_i be the difference between the discounted expected benefits and costs of foreclosing on loan i. If F_i is positive the lender forecloses, otherwise he grants an extension. Therefore, the frequency of foreclosure is

$$F_F = [\int_0^{F_{max}} g(f)\,df][PD]$$

where $\int_0^{F_{max}} g(f)\,df$ is the proportion of delinquent loans on which the lender forecloses and PD is the proportion of all loans that is delinquent.

Factors altering this frequency include changes in expected farm earnings (across all borrowers) or in government programs and changes in nominal interest rates. A general decrease in expected earnings shifts the distribu-

[18] An important determinant of the magnitude of some of these costs during the 1930s may have been the expected social reaction to foreclosures - several accounts can be found of penny auctions, beatings and near lynchings.

tion of F_i's to the right, thereby increasing the frequency of foreclosure, while the initiation of a new farm-subsidizing government program shifts the distribution of F_i's to the left, thereby decreasing the incidence of foreclosures. An increase in interest rates raises the opportunity costs of funds tied up in delinqent loans, hence increasing the benefits of foreclosing and the frequency of foreclosures.

A loan agreement may also be terminated if the borrower files for bankruptcy. The borrower makes the choice between declaring bankruptcy and adhering to the present mortgage agreement so as to maximize the expected net present value of his wealth. A declaration of bankruptcy results in costs of court proceedings, moving one's family, and diminished credit ratings, while benefits arise from escaping an onerous obligation.

Let B_i be the discounted expected net gains to borrower i from declaring bankruptcy. On those loans with $B_i > 0$, borrowers will file for bankrupty. The frequency of bankruptcy is therefore,

$$F_B = \int_0^{B_{max}} h(b)\,db$$

The frequency varies with changes in expected earnings, government policies, and interest rates. It may differ from the frequency of foreclosure because of differences between lenders and borrowers in expectations of future earnings, and because of differences in the costs and benefits to lenders and borrowers of foreclosure and bankruptcy.

Farm failures resulting from early termination of mortgage agreements can arise from either foreclosures or bankruptcies. The frequency of failure is the frequency of foreclosure plus the frequency of bankruptcy minus the

proportion of loans on which borrowers wish to declare bankruptcy and lenders wish to foreclose.

The farm failure process is dynamic for three reasons. First, because of the great uncertainty inherent in agriculture, and because termination and renegotiation of contracts are costly, agreements will not be reached unless the borrower has a cushion (e.g., savings, unattached assets, etc.) for protection in a bad year or two. Most likely the effects of changes in conditions during a particular time will persist for a while. For example, a borrower may survive a drought in one year by drawing down his savings, but this affects his ability to meet his payments in the future. A one-period specification of the farm failure process could mislead by leaving out such persistent effects of past changes.

Second, even if current earnings and assets are not sufficient to allow a borrower to make his present mortgage payments, both parties may choose to extend the contract (rather than foreclosing or declaring bankruptcy) if they expect that future income will be sufficient to meet past-due and future mortgage payments. Foreclosure by lenders or the declaration of bankruptcy by borrowers is not costless; if earnings are expected to recover in the future, deferal of payments may be the least costly alternative. Insofar as expectations of future ability to pay are influenced by factors that affected past ability to pay, a weighted average of measures of current and past ability to pay (e.g., earnings) can be used as a proxy for expected future ability to pay. A dynamic specification of the farm failure process in which current and past values of explanatory variables are used to explain farm failure rates is therefore appropriate.

The desire of lenders to protect their reputational capital suggests a third source of dynamics. During economic downturns a lender's ability to delay foreclosures (and protect the value of his goodwill capital) depends on the strength of his portfolio. This ability depends on his access to capital markets and on the flow of mortgage payments in previous periods. For example, insurance companies had a wider range of assets in their portfolios and better access to capital markets than individuals or local banks. Past mortgage payments depend on earnings in previous periods.

Both the complexity of the dynamics of the farm failure process and additional reasons for expecting earnings to affect farm failures with a lag are suggested by the following observation on farm distress during the interwar years:

> There was a very irregular lag between the time a farmer first felt the impact of falling incomes against relatively unchanged costs and the time the farm appeared in the foreclosure statistics. This lag was occasioned by a variety of factors. In the first place, the companies avoided foreclosure wherever possible and extended leniency to deserving owner-operators until about two years' unpaid interest had accumulated. Second, the foreclosure proceedings took some time. Third, periods of redemption lasted from a few weeks to several years under the new moratorium laws. These had to run out before the life company obtained a good title. Fourth, there was some difference between companies and between years as to the method of reporting foreclosed farms held subject to redemption. For these reasons, the foreclosure was reported some time after the occurrence of the difficulty, but the lag was so irregular as to defy precise analysis. (Woodruff 1937, pp. 64-66).

III. Empirical Specification and Results

The general form of the specification used to investigate the dynamic relationship between rates of farm failure and levels of earnings is

$$(1) \quad FAIL_{it} = C(L)EARN_{it} + u_{it}$$

where $FAIL_{it}$ is the annual rate of failure (per thousand farms) in state i during year t, $EARN_{it}$ is earnings in state i during year t, and $C(L)$ is a polynomial (of unspecified order) in the lag operator, L, with $L^k EARN_{it} = EARN_{it-k}$. As suggested above, current and past values of $EARN_{it}$ play three roles. First, for an individual farmer, changes in the level of earnings reflect changes in conditions that determine his ability to pay, e.g., yield per acre, crop prices. Earnings data aggregated to the state level summarize these conditions. Changes in conditions at a particular time affect future ability to pay through their effects on borrower's savings and unattached assets; hence the introduction of earnings from previous periods. Second, a weighted average of current and past earnings can be viewed as conveying information to both borrowers and lenders concerning the expected future earnings of borrowers. Third, lagged earnings affect the current ability of lenders to protect their goodwill capital by delaying foreclosures during periods of generally low earnings. Because the dynamics of the farm failure process originate from the three sources discussed above, as well as from those described by Woodruff, we do not attempt to specify the form of the lag structure on earnings a priori. Instead, we let the data dictate the form of the estimated lag structure.

Specification

Aggregate farm income varies across states with the absolute size and relative importance of the agricultural sectors. For example, farm income in

California is much greater than farm income in New Jersey. We adjust for such interstate differences by using the ratio of earnings in state i during year t to average earnings in that state in a base period (1924-1925) as our empirical proxy for earnings ($REARN_{it}$).[19]

The influence of a change in earnings in a particular year on farm failures in that year and future years depends on the levels of earnings in neighboring years. For example, the effect of a change in earnings in year t on failure rates in year t will depend on the level of earnings in earlier years. If earnings in years t-1, t-2, etc., increase, debtors' stocks of savings will be larger (ceteris paribus), and the effect of a decrease in earnings on contemporaneous failure rates will be smaller. Similarly, the influence of earnings in year t-j on failure rates in year t depends on the level of earnings in periods t, t-1, etc. These effects are incorporated into our estimating equations by including a series of interactive earnings terms ($INREARN01_{it}$, $INREARN012_{it}$, etc.) which are the products of the appropriate earnings variables. For example, $INREARN012_{it} = (REARN_{it}) x (REARN_{it-1}) x (REARN_{it-2})$.

In light of our discussion above, one expects increased involvement in credit markets by federal credit agencies to decrease farm failure rates. The variable included to test for this effect is the percentage of outstanding mortgage debt held by federal credit agencies (%FEDDEBT). This variable varies across years and across states in a given year.

Roughly half of the state legislatures enacted laws placing temporary moratoria on foreclosures in 1933 and 1934. The effects of these attempts to

[19]Because mortgage payments were fixed in nominal terms, we use nominal (rather than real) earnings in our empirical analysis.

alleviate farm failure problems are measured with a dummy variable (MOR) assigned a value of 1 for a state in any year in which such legislation was in effect for six months or more; zero otherwise. The moratoria may have simply delayed rather than prevented the failure of some farms, in which case an increase in farm failures would have followed the expiration of the legislation. To test for this possibility, another dummy variable (POSTMOR) is included: it is assigned a value of 1 for the two years following the expiration of moratorium legislation; zero otherwise.

Insofar as the AAA programs achieved their objectives, their effects are captured indirectly by our earnings variable, which includes both cash receipts from farm marketings and government payments. After presenting our estimation results, we combine information on the magnitude of these two components of earnings with our regression estimates to develop crude estimates of the upper and lower bounds of the effects of these programs on farm failures.

In addition to earnings and government programs a number of other factors might be expected to influence farm failure rates. Alston (1983) suggests several possible sources of interstate differences, three of which are included as explanatory variables. First, we include a variable (%FM30) to net out the effects of differences in the prevalence of farm mortgage debt across states. Because a farmer could not be foreclosed without a mortgage, the greater the percentage of farms mortgaged in a state (ceteris paribus), the higher the rate of farm failure.

Second, previous researchers have suggested that proximity to urban areas provided opportunities to earn off-farm income during periods of depressed farm incomes.[20] Alston (1983, p. 891) also suggests that

[20] Jones and Durand (1954, pp. 110-112 and 126).

> Not only were off-farm earnings opportunities more likely available but, in general, farmers near densely populated areas produced goods - dairy products, vegetables, and poultry products - that had a stable market. In addition, farmers close to large urban financial intermediaries may have been able to secure mortgages at lower interest rates than their more rural counterparts. Futhermore, the value of farms close to urban areas fell less than elsewhere, partly because of alternative nonagricultural land uses.

The variable included to measure this effect was the percentage of each state's population that was urban in 1930 (%URB30). We expect that, for a given level of farm earnings, failure rates are lower in more urban states.

During the boom period following WWI, land prices were bid up and mortgage debt was increased by varying amounts in different states. Johnson has suggested that overly optimistic expectations following WWI may have led to "excessive expansion" and increased failure rates later. The variable included in our model to control for the effects of cross-sectional differences of this sort is the ratio of land values in 1920 to land values in 1912 (LV20/LV12). If Johnson's hypothesis is correct (and if the effects had not been exhausted by the period of our sample), the coefficient on this variable is positive.

A fourth cross-sectional variable is included to measure the effects of differences in earnings variation across states. This variable (VARREARN) is calculated for each state as the variance of REARN over the period of our sample. If farm failures result in part because earnings fall below a threshold level, then more farms will fall below the threshold the greater is the variance in earnings.

A variable that measures the ratio of farm mortgage debt to agricultural land values (DEBT/VALUE) is also included. This variable which varies across both states and years provides an additional control for the effects of differences in indebtedness across states. Whereas the percentage of farms

mortgaged in each state (%FM30) can be viewed as capturing the prevalence of debt, the ratio of mortgage debt to land value (DEBT/VALUE) can be viewed as measuring the burden of agricultural debt. As such, it is expected to have a positive estimated coefficient.

The model presented earlier suggests that changes in interest rates will influence failure rates by changing the opportunity costs to lenders of granting extensions. Because no data on interest rates at the state level could be found for the period of our sample, the rate on prime commercial paper in New York was used as our measure of interest rates (INTRATE). To the extent that changes in this interest rate are correlated with changes in the return on opportunities facing lenders, this variable will have a positive coefficient.

The earnings variable used in our empirical analysis is a measure of gross earnings. To obtain measures of the effects of earnings on failure rates, holding costs of production constant, we include a variable (PPAID) to control for the effects of changes in production costs. The index of production costs is based on national data, so although it varies across years, it is constant across all 48 states in a given year.

Finally, we have included the aggregate annual U. S. unemployment rate (UNEMP) to measure movements in national economic activity not captured by our earnings variable. If economic activity in agriculture moves with the general economy, the coefficient on this variable is positive.

The directions of causation between the lending of federal credit agencies and farm failures, and between state moratoria legislation and farm failures are not one-way. With the advent of the Roosevelt administration, policymakers designed federal credit programs to respond to calls for relief of farm dis-

tress.[21] While federal credit programs may have affected the incidence of farm failures, high levels of farm distress also affected the relative activity of federal credit agencies. Similarly, while legislated moratoria presumedly affected failure rates, they were also legislative responses to high levels of farm distress.

To correct for the simultaneity problems that result from this joint dependence between FAIL, %FEDDEBT, and MOR, we estimate the following three-equation system.

$$(2)\quad FAIL_{it} = \alpha_0 + \alpha_1\ \%FM30_i + \alpha_2\ \%URB30_i + \alpha_3\ (LV20/LV12)_i + \alpha_4\ VARREARN_i + \alpha_5\ \%FEDDEBT_{it} + \alpha_6\ MOR_{it} + \alpha_7\ POSTMOR_{it} + \alpha_8\ (DEBT/VALUE)_{it} + \alpha_9\ INTRATE_t + \alpha_{10}\ PPAID_t + \alpha_{11}\ UNEMP_t + \sum_{j=0}^{J} \Omega_j\ REARN_{t-j} + \sum_{k=1}^{K} \sigma_k\ (INEARN\phi \ldots k) + u_{it}$$

$$(3)\quad \%FEDDEBT_{it} = \beta_0 + \beta_1\ FAIL_{it} + \beta_2\ FDRDUM_t + \beta_3\ (FDRDUM_t)(FAIL_{it}) + v_{it}$$

$$(4)\quad MOR_{it} = \phi_0 + \phi_1\ FAIL_{it} + \phi_2\ \%FM30_i + \phi_3\ \%FEDDEBT_{it} + \phi_4\ \%AGINCOME_{it} + \epsilon_{it}$$

The first equation, which estimates the effects of different factors on the farm failure rate, was discussed in detail above. Because our motivation for estimating the second and third equations is only to control for bias in the first equation, we shall be brief in discussing their specifications.

Explanatory variables for %FEDDEBT in the second equation include the farm failure rate in state i in year t (FAIL), a "Roosevelt dummy variable" (FDRDUM), that takes a value of 0 prior to 1933 and a value of 1 during and after 1933, and an interactive term between FAIL and FDRDUM. If the government made more loans in distressed areas, the coefficient on $FAIL_{it}$ is positive. The Roosevelt dummy captures changes in policy beginning in 1933.

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[21] Previously the stated task of federal credit agencies was to provide a source of agricultural credit, not to act to alleviate farm credit problems associated with low earnings and difficulties in meeting mortgage payments.

Because the Roosevelt administration greatly expanded the farm loan operations of the federal government, we expect a positive coefficient on FDRDUM. If the federal loan programs were more responsive to farm distress after 1932, the coefficient on the interactive term between FAIL and FDRDUM is positive.

The third equation, whose dependent variable is MOR (a zero-one dummy variable), is estimated as a logistic regression equation. Its specification follows that of Alston (1984). Explanatory variables include the farm failure rate (FAIL), the percentage of the state's farms mortgaged in 1930 (%FM30), the proportion of mortgage debt held by federal credit agencies (%FEDDEBT), and the proportion of total state income from agriculture (%AGINCOME). If a higher rate of farm failure increases political pressure for a moratorium, the coefficient on FAIL is positive.[22] The greater the percentage of farms mortgaged, the larger is the number of farms at risk to be foreclosed and the greater is political support for a moratorium; hence a positive coefficient on %FM30. The greater the percentage of agricultural income in a state, the less is the political resistance to and the greater is the support for a moratorium; hence a positive coefficient on %AGINCOME. If the federal land banks were more lenient than other creditors, there was less pressure for a moratorium the greater was the percentage of mortgage debt held by those banks; hence a negative coefficient on %FEDDEBT.

[22]The existence of lags in the institution of relief programs suggests that %FEDDEBT and MOR will be influenced by contemporanceous and lagged failure rates. This possibility was investigated empirically and estimated coefficients on these lagged failure rates (first order lags in both equations and a second order lag in the third) were statistically significant. However the inclusion of these variables drastically increased the computer time required for the nonlinear estimation alogrithm to converge (in some of the specification tests convergence could not be obtained), and their inclusion had little effect on the estimated coefficients and standard errors in the first equation (the focus of our interest). We therefore choose to report the results obtained with static specifications of the second and third equations.

The instruments from the second and third equations that allow consistent estimation of the coefficients in the first equation are FDRDUM and %AGINCOME.

Results

Definitions and sources for all variables appear in Table 2. Table 3 displays the coefficient estimates and summary statistics from our dynamic specification of the farm failure equation.[23] The variables entering in a dynamic fashion are the earnings variables ($REARN_t$, $REARN_{t-1}$, etc.) and the multiplicative earnings terms (INREARNO1, INREARNO12, etc).[24] The former has statistically significant effects on failure rates with a fourth order lag, while the general significance of the multiplicative terms suggests that earnings influence failure rates in a complex fashion.[25]

Of the four variables included to control for cross-sectional variation, all have the predicted algebraic signs, but only the estimated coefficients on %URB30 and LV20/LV12 are statistically significant. The estimated coefficient of the time series-cross sectional variable DEBT/VALUE, included to control for

[23] Two-stage least squares regression estimates were obtained using the SAS procedure for estimating nonlinear simultaneous-equations systems. Nonlinearities in the system have two sources. First, the autoregressive parameter in the first equation (AR(1)) was estimated using a nonlinear specification. Second, the third equation was estimated as a logistic regression model.

[24] Higher order lag coefficients on DEBT/VALUE and %FEDDEBT were estimated but were not significant.

[25] These results differ substantially from those of Shepard and Collins (1982). They estimated their model using farm bankruptcy data aggregated at the national level and found that (1) for the interwar period, their proxy for income did not significantly affect bankruptcy rates and (2) "the explanatory power of the equations was not significantly enhanced by further inclusion of lagged variables" (p. 612).

the effects of differences in the burden of farm mortgage debt, has the predicted positive sign and is significantly different from zero.

If the value of future earnings is fully capitalized into the price of land, measurement of the effects of contemporaneous and past earnings on failure rates may be confounded by including a variable (DEBT/VALUE) having an index of land values in its denominator. Deletion of DEBT/VALUE from the regression specification has no effect on the estimated coefficients and standard errors of the other explanatory variables.

To investigate the influences of lagged earnings in our model, an index of land values (that varied across states and years) was added to the model. The estimated coefficient on this variable was insignificant (asymptotic t-ratio = .44) and its introduction did not affect the estimated coefficients or standard errors of the other variables. One interpretation of this result is as follows. If the lagged earnings variables are acting primarily as proxies for expected future earnings, they should be highly correlated with land values. The introduction of land values as an explanatory variable would then be expected to result in increased standard errors and reduced t-ratios for the earnings variables. That this does not happen suggests that the lagged earnings variables are playing other roles in our model; perhaps they are proxies for the effects of changes in personal savings on failure rates, or for the status of lender portfolios.

With respect to the effects of the different government programs, three conclusions can be drawn. First, insofar as earnings were affected by the programs initiated under the AAA, the negative estimated coefficients of the earnings variables suggest that (at least initially) the programs were success-

ful.[26] Second, the negative and significant estimated coefficient on %FEDDEBT (the percentage of farm mortgage debt held by federal credit agencies) is consistent with the hypothesis that the attempts by the federal government to alleviate distress through the refinancing of loans and lenient foreclosure policies were successful in reducing farm failure rates. Finally, the significance of the estimated coefficient of MOR suggests that the foreclosure moratoria legislated by roughly half of the states during the 1930s had the intended effect on farm failure rates.

The variable POSTMOR was included to measure any after-effects of the moratoria. The suggestion that the laws simply delayed foreclosures until the moratoria expired is not supported by our results. The negative and statistically significant coefficient of POSTMOR may indicate that the beneficial effects of moratoria extended past their expiration dates. Alternatively, this variable may simply be picking up effects of the general improvement in the economy in the late 1930s not captured by UNEMP.

A particularly striking feature of our results is the significance of the coefficient of the autoregressive error (AR(1)). This is probably a reflection of the complexity of events associated with the Great Depression and indicates that one or more strongly systematic and influential explanatory variables have not been included in our regression equations.[27]

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[26] In this study we have not tested for the possibility that in the long run (after the value of program payments was capitalized into land values) the programs did not have any effect on farm failure rates. Future research using data extending over a longer time period will address this issue.

[27] The estimated coefficients and asymptotic t-ratios for the second and third equations of our simultaneous system are

$$\underset{}{\%FEDDEBT} = \underset{(1.7)}{4.26} + \underset{(4.1)}{.42FAIL} + \underset{(11.2)}{39.3FDRDUM} - \underset{(-5.9)}{.94FDRDUM*FAIL}$$

The Effects of Government Relief Programs

The regression coefficients in Table 3 can be used in combination with other contemporary information to obtain crude estimates of the magnitude of the effects of the government relief programs. These programs prevented low income farmers from failing by offering attractive mortgages, prohibiting foreclosures, and increasing incomes. Two extreme assumptions concerning the distributional effects of these programs are (1) that they prevented the same farms from failing year after year, and (2) that they prevented different farms from failing each year. If individual farmers' relative earnings positions did not change over time so that farmers with relatively low earnings one year also had relatively low earnings in other years, then the first assumption is appropriate. If relative earnings positions changed greatly so that farmers with relatively low earnings one year had relatively high earnings in other years, then federal government programs saved different farms from failing each year and the second assumption is appropriate.

We estimate the number of farms saved by each of the three government relief programs under both of these assumptions to provide upper and lower

$$\underset{}{MOR} = \underset{(-5.4)}{-3.9} + \underset{(2.6)}{.03FAIL} + \underset{(2.4)}{.03FM30} + \underset{(1.3)}{.01\%FEDDEBT} - \underset{(-1.9)}{3.3\%AGINCOME}$$

In the second equation, the coefficient on FDRDUM has the predicted sign and is statistically significant. The positive and significant coefficient on FAIL suggests that federal credit agencies played a relatively larger role in areas (or times) of higher distress, even before Roosevelt initiated changes. The negative and significant coefficient on the interactive term between FAIL and FDRDUM is counter to our expectations. In the third equation, FAIL and %FM30 both have the expected signs and are significant at an α level of .05. The estimated coefficients of both %FEDDEBT and %AGINCOME have the wrong signs and marginally significant t-values. Although the equations were formulated and estimated to correct for simultaneity bias in the first equation, the "incorrect" signs raise interesting questions for future research.

bounds on the magnitude of their influence. These estimates appear in Tables 4 - 6. Tables 4a, 5a, and 6a provide minimum estimates of the effects of relief programs, corresponding to the assumption that government programs saved the same farms year after year with a given flow of relief efforts. Tables 4b, 5b, and 6b provide maximum estimates of the effects of government programs, corresponding to the assumption that different farms were saved each year by a particular flow of relief efforts.

Tables 4a and 4b show the preventative effects of the expanded role of federal credit agencies. We calculate these effects by first multiplying the change in %FEDDEBT for each year by the coefficient from our regression results (-.488). The resulting change in Fail (column 4) is per thousand farms. Consequently, we multiply column 4 by column 5 and divide by 1000 to arrive at the number of farm failures prevented.[28] For example, between 1934 and 1935 the federal government increased their percentage of the mortgage debt by 15.9 percentage points. According to our lower bound estimates in Table 4a this induced a decline in failure rates of 15.9(.488) = 7.759 per thousand farms and prevented 7.759(6,096,094)/1000 = 47,300 farms from failing. In this calculation we assume that the same farms from earlier years (9900 in 1934 and 1139 in 1933) were still being saved and should not be counted again.

In Table 4b we assume that new farms were saved every year, so that the base from which we calculate the change in %FEDDEBT is always 1930-32. Between 1934 and 1935 this alternative assumption results in an increase of 58,583 - 47300 = 11,283 in our estimate of the number of farms saved from failure. This is because the .4 unit increase in %FEDDEBT in 1933 and the 3.4 unit

[28] A similar procedure is used to obtain the estimates in the final columns of Tables 5 and 6.

increase in 1934 saved different low income farmers in 1933 and 1934 than in 1935. The cumulative difference in the estimated number of farm failures prevented by the increased role of federal credit agencies is considerable. Our lower bound estimate is 74,178 farms, while our upper bound estimate is 436,145.

Tables 5a and 5b display the estimated lower and upper bound effects of state moratorium legislation. Compare, for example, the estimated effects of moratoria in 1934. In Table 5a the only new failures prevented are in those four states with newly instituted moratoria. In the other seventeen states with moratoria in effect, the same farms were saved (by assumption) in 1934 as in 1933. In Table 5b, farm failures are prevented in the four states with new moratoria, as well as in the other seventeen states with moratoria in effect since 1933. In the latter states, a different set of farms were (by assumption) saved in 1934 than in 1933. The resulting lower and upper bounds on the estimated total number of farm failures prevented by moratoria are 40,946 and 119,784.

Tables 6a and 6b provide estimates of the effects of the AAA programs. To estimate the effects of these programs on farm failures, we first estimate their effects on earnings. Little analysis of this topic has been undertaken, so we proceed by developing two crude measures of these effects. To obtain our first measure (corresponding to column (2A) in Tables 6a and 6b), we assume that <u>all</u> of the change in agricultural income from farm marketings and government payments at the national level resulted from the AAA, and that in the absence of these programs, farm earnings would have continued at their 1932 levels indefinitely. To obtain our second measure (column (2B) in Tables 6a and 6b), we assume that income from farm marketings was changing for other

reasons (perhaps monetary policies of the Federal Reserve, or random variation due to weather conditions) and that the only effect AAA programs had on income was through direct government payments.

Given these assumptions, we use the estimated coefficients of the contemporaneous and lagged earnings and interactive earnings variables of Table 3 to calculate the long-run effect of a one unit change in REARN on the annual rate of farm failures (columns (3)). This number is multiplied by our two measures of the yearly effects of the AAA on earnings to obtain the annual change in failures per thousand farms resulting from the AAA programs (columns (4)). These estimates are then multiplied by the number of farms in the U.S. (divided by 1000) to obtain our estimates of the number of farm failures prevented (columns (6)).

In Table 6a, the assumption that the same farms have low income year after year suggests that a constant flow of income from the AAA programs only affects farm failures when that flow is initiated. Additional farms are saved only if the flow of income increases. Thus, in column (4A) farm failure rates decrease when REARN rises and increase when REARN falls. This logic also suggests that the total number of farm failures prevented under the assumption that AAA programs only affect farm incomes through direct government payments (columns B) is the maximum of the entries in column (6B) rather than the sum. That is, the government payments between 1938 and 1939 prevented the same 7,907 farms from failing as between 1937 and 1938, plus an additional 6,422 farms.

In Table 6b the assumption that different farms have the lowest incomes in different years suggests that a given flow of income from AAA programs will save different farms each year. In this case the annual effect of AAA programs in column (2A) is the difference between REARN in a particular year and REARN

in 1932.[29] In column (6B) annual government payments save different farms each year, so the estimated total number of farm failures prevented is the sum of all the entries in that column.

The estimates developed in Tables 4 - 6 suggest that the expanded role of federal credit agencies saved between 74,178 and 436,145 farms from 1933 to 1940, that the state legislated moratoria saved between 40,946 and 119,784 farms from 1933 to 1938, and that the AAA programs saved between 14,329 and 573,679 farms from 1933 to 1940. Summing across programs, our estimates suggest that the government relief programs saved between 129,453 (= 40946 + 74,178 + 14,329) and 1,129,608 (= 119,784 + 436,145 + 573,679) farms during the 1930s. We suspect that there is relatively little temporal movement of farmers within the income rankings (i.e., the same farmers have trouble meeting their mortgage payments year after year) so that the actual number of farms saved by these programs is probably much closer to the lower than the upper estimate.

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[29] The assumption in this case is that REARN would have remained at its 1932 level in the absence of AAA programs.

VI Conclusions

Our empirical results are consistent with the hypothesis that government programs successfully alleviated farm distress during the 1930s. Our counterfactual estimates suggest that state moratoria, programs by federal credit agencies and benefits from the Agricultural Adjustment Act and its successors saved a maximum of roughly one million farms from failing.

Before our estimates are used to assess the welfare implications of government intervention, several issues must be addressed. First, although it is often assumed that preventing farm failures is beneficial, some level of failures is a sign of a healthy, growing economy. Unfortunately because we do not have a model of the optimal level of farm failures we cannot determine whether government relief programs of the Great Depression corrected a "market failure" or interfered with properly functioning market processes. Second, we have not determined whether the government programs instituted in the 1930s yielded benefits extending beyond that decade. Third, although measuring the costs of intervention is beyond the scope of this paper, it is possible to indicate the sorts of costs imposed on various parties. A final judgment on the worth of intervention must weigh the following costs against whatever benefits might be obtained from preventing failures.

State moratorium legislation imposed costs on lenders by restricting their ability to exercise an option originally included in their contracts with borrowers. In response they may have reacted by increasing interest rates on later mortgage contracts or by more carefully rationing mortgage loans to farmers. Such responses imposed costs on prospective farmers who were precluded from obtaining mortgage loans under the more restrictive policies.

The modified programs of federal credit agencies imposed costs on taxpayers and private creditors. The U. S. Treasury subsidized the activities of the federal land banks and Land Bank Commissioner, thereby enabling them to finance loans at lower interest rates and reduced principal. In addition, expanded lending by federal credit agencies may have "crowded out" private lenders. Finally, the programs initiated by the AAA had both direct costs (administrative as well as transfer payments to farmers) and less apparent efficiency costs. In all likelihood, the costs associated with the AAA dwarfed the costs of the other programs.

Despite the initial and continuing costs of government intervention in the farm sector, they might be justified if this intervention results in long-run stability. The attainment of such stability seems unlikely. We expect benefits from government programs to be capitalized into land values. Once this capitalization occurs there is no reason to expect that government programs will continue to reduce farm failures. The current distress in the farm community supports this view and suggests that although we continue to pay the costs of agricultural programs, they are no longer effective in reducing failure rates.

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Table 1
U.S Average Failure Rate per 1000 Farms, 1913-1940

Year	(1) Failure Rate	(2) Index of Prices Received	(3) Index of Prices Paid	(4) Net Farm Income	(5) Index of Land Values	(6) Mortgage Debt Outstanding
1913	¦	101	101	3,873	100	4.348
1914	¦	101	100	3,569	103	4.707
1915	¦	98	105	3,804	103	4.991
1916	avg. =	118	124	4,737	108	5.256
1917	3.2	175	149	7,048	117	5.826
1918	¦	202	176	8,759	129	6.537
1919	¦	213	202	9,332	140	7.137
1920	¦	211	201	6,921	170	8.449
1921	¦	125	152	3,725	157	10.221
1922	avg. =	132	149	4,208	139	10.702
1923	10.7	142	152	4,951	135	19.786
1924	¦	143	152	5,228	130	10.665
1925	17.4	156	157	6,223	127	9.913
1926	18.2	145	155	5,790	124	9.713
1927	14.7	139	153	5,766	119	9.658
1928	14.7	149	155	5,699	117	9.757
1929	15.7	146	153	6,130	116	9.757
1930	18.7	126	145	4,430	115	9.631
1931	28.4	87	124	2,829	106	9.458
1932	38.8	65	107	1,898	89	9.214
1933	28.0	70	109	2,692	73	8.638
1934	21.0	90	123	3,766	76	7.887
1935	20.3	108	125	4,500	79	7.786
1936	18.1	114	124	5,064	82	7.639
1937	14.3	121	130	5,095	85	7.390
1938	13.5	95	122	4,232	85	7.214
1939	12.6	93	121	4,261	88	7.071

column (1): Failure rate per thousand farms per year. Sources: USDA, "The Real Estate Situation," annual issues, 1926-1942.

column (2): Prices received for all food groups (August 1909-July 1914 = 100). Source: USDA, Agricultural Statistics, 1940 (Table 693, p. 573).

column (3): Prices paid for all commodities bought for use in production and family maintenance (calendar years 1910-1914 = 100). Source: USDA, Agricultural Statistics, 1940 (Table 692, p. 572).

column (4): Realized net income including government payments (millions of dollars). Source: USDA, Farm Income Situation (December 1952-January 1953, Table 1, p. 4).

column (5): (1912-1914 =100) Source: USDA, Agricultural Statistics, 1940 (Table 702, p. 585).

column (6): (millions of dollars) Source: USDA, Horton, et al. (1942, Table 1, p. 1).

Table 2
Definitions of Variables

$FAIL_{it}$ - Dependent variable. Failure rate per 1000 farms in state i during year t (Mar. 15 of year t- Mar. 15 of year t+1). Sources: USDA, "The Farm Real Estate Situation," annual issues, 1926-1942.

$\%FM30_i$ - Percentage of farms in state i mortgaged in 1930. Source: U.S. Department of Commerce (1943, Table 17).

$\%URB30_i$ - Percentage of population in state i that was urban in 1930. Source: U.S. Department of Commerce (1942, Table 8).

$LV2/LV12_i$ - Ratio of indexes of land values (1920/1912) in state i. Source: USDA, "Farm Real Estate Situation," Circular No. 662 (November 1942, pp 4-5).

$VARREARN_i$ - Variance of REARN in state i for the period 1924-1940.

$\%FEDDEBT_{it}$ - Percentage of total debt held by federal credit agencies in state i as of time t. Source: USDA, Larsen (August 1945).

$DEBT/VALUE_{it}$ - Debt to value ratio in state i as of year t. Sources: Index of per acre land values was found in USDA, Regan and Johnson (November 1942). An index of farm mortgage debt was contructed (base year = 1924) from data on farm mortgage debt found in USDA, Horton et al. (1942).

$PPAID_t$ - National index of prices paid by farmers in year t for family living and production expenses, and interest, taxes and wages. Source: U.S. Bureau of the Census (1975, p. 489).

$UNEMP_t$ - U.S. annual average unemployment rate in year t. Source: U.S. Bureau of the Census (1975).

$INTRATE_t$ - Prevailing rates on customer's prime commercial paper (4-6 months) in New York in year t. Source: Federal Reserve Bulletins, Volumes 10-25.

$REARN_{i,t-k}$ - ratio of earnings (cash receipts from farm marketings and government payments) in year t-k to earnings in a base period (average of earnings in 1924 and 1925) in state i. Source: USDA (January 1946).

INREARNijk - Interactive term between $REARN_{t-i}$, $REARN_{t-j}$, and $REARN_{t-k}$.

MOR_{it} - dummy variable to indicate whether foreclosure moratorium legislation was in effect in state i in year t. This variable was assigned a value of 1 if such legislation was in effect for at least 6 months of a given year, and a value of 0 otherwise. Source: U.S. Congress (April 1936).

$POSTMOR_{it}$ - dummy variable included to pick up possible "after effects" of foreclosure moratorium legislation. This variable was assigned a value of 1 for two years following the expiration of moratorium legislation, and a value of 0 otherwise. Source: U.S. Congress (April 1936).

FORDUM - "Roosevelt dummy." This variable was assigned a value of 0 for years prior to 1933 and a value of 1 for 1933 and after.

$\%AGINCOME_{it}$ - Percent of total income from agriculture in state i in year t. Source: Hanna (1959, pp. 28-29 and 248-49).

Table 3
Determinants of Farm Failures, 1929-1939*

Dependent Variable: $FAIL_{it}$

Independent Variable	Coefficient Estimate	Asymptotic t-ratio
Constant	40.57	1.63
$\%FM30_i$	.056	.51
$\%URB30_i$	-.201	-2.16
$LV20/LV12_i$	.091	1.92
$VARREARN_i$	.013	1.39
$\%FEDDEBT_{it}$	-.488	-4.05
$(DEBT/VALUE)_{it}$	7.96	3.24
$PPAID_t$	.104	.21
$UNEMP_t$	.522	1.73
$INTRATE_t$	.505	1.08
$REARN_{it}$	-.378	-4.77
$REARN_{it-1}$	-.259	-3.72
$REARN_{it-2}$	.196	3.88
$REARN_{it-3}$	-.006	-.12
$REARN_{it-4}$	-.242	-5.13
INREARN01	.005	4.00
INREARN012	-2.7E-5	-2.45
INREARN0123	-7.0E-8	-.74
INREARN01234	1.1E-9	2.03
MOR_{it}	-11.2	-3.18
$POSTMOR_{it}$	-6.24	-2.99
AR(1)	.706	20.1
R^2	.771	
Sum of Squared Errors	14684	
degrees of freedom	498	
Root Mean Squared Error	5.43	
Mean of Dependent Variable, 1929-1939	19.52	

*Earnings data for 1925-1929 were used as presample values for the lagged REARN variables. Regional dummy variables were also included in this equation to correct for possible omitted variable bias.

Table 4a
Minimum Estimated Effects of the Expanded Role of Federal Credit Agencies on Farm Failures, 1933-1940

Year	(1) %FEDDEBT	(2) Change in %FEDDEBT	(3) δFAIL / δ%FEDDEBT	(4) Change in FAIL due to change in %FEDDEBT	(5) Number of farms in the U.S.	(6) Number of farm failures Prevented
1930-32	12.4	---	---	---	---	---
1933	12.8	+ .4	-.488	- .195	5,838,605	1139
1934	16.2	+ 3.4	-.488	-1.659	5,967,350	9900
1935	32.1	+15.9	-.488	-7.759	6,096,094	47300
1936	37.4	+ 5.3	-.488	-2.586	5,987,977	15585
1937	39.1	+ 1.7	-.488	- .830	5,879,860	4880
1938	39.3	+ .2	-.488	- .098	5,771,743	566
1939	38.5	- .8	-.488	+ .390	5,663,626	- 2209
1940	37.4	- 1.1	-.488	+ .537	5,555,508	- 2983
				Total number of farm failures prevented, 1933-1940		74,178

column (1): See Table 2 for definition and sources.
column (2)$_t$ = column (1)$_t$ - column (1)$_{t-1}$
column (3): Estimated regression coefficient from Table 3
column (4) = [column (3)]x[column (2)]
column (5): Source for 1935 and 1940 is the U.S. Census of Agriculture. Numbers for noncensus years are estimated by linear interpolation between census years. To better approximate the number of farms that could be mortgaged, we delete the number of farms operated by sharecroppers from the census figures. This procedure was first suggested in USDA, Wiecking (October 1927, p. 35).
column (6) = [column (4)]x[column (5)]/1000

Table 4b
Maximum Estimated Effects of the Expanded Role
of Federal Credt Agencies on Farm Failures
1933-1940

Year	(1) %FEDDEBT	(2) Change in %FEDDEBT	(3) δFAIL δ%FEDDEBT	(4) Change in FAIL due to change in %FEDDEBT	(5) Number of farms in the U.S.	(6) Number of farm failures Prevented
1930-32	12.4	---	---	---	---	---
1933	12.8	+ .4	-.488	- .195	5,838,605	1139
1934	16.2	+ 3.8	-.488	- 1.85	5,967,350	11040
1935	32.1	+19.7	-.488	- 9.61	6,096,094	58583
1936	37.4	+25.0	-.488	-12.20	5,987,977	73053
1937	39.1	+26.7	-.488	-13.03	5,879,860	76615
1938	39.3	+26.9	-.488	-13.13	5,771,743	75783
1939	38.5	-26.1	-.488	+12.74	5,663,626	72155
1940	37.4	-25.0	-.488	+12.20	5,555,508	67777
				Total number of farm failures prevented, 1933-1940		436,145

column (1): See Table 2 for definition and sources.
column (2)$_t$ = column (1)$_t$ - 12.4
column (3): Estimated regression coefficient from Table 3
column (4) = [column (3)]x[column (2)]
column (5): Source for 1935 and 1940 is the U.S. Census of Agriculture. Numbers for noncensus years are estimated by linear interpolation between census years. To better approximate the number of farms that could be mortgaged, we delete the number of farms operated by sharecroppers from the census figures. This procedure was first suggested in USDA, Hiecking (October 1927, p. 35).
column (6) = [column (4)]x[column (5)]/1000

Table 5a
Minimum Estimated Effects of State Moratoria
on Farm Failures, 1932-1936

Year	(1) Number of states instituting moratoria	(2) Number of farms in states instituting moratoria	(3) $\frac{\delta FAIL}{\delta MOR}$	(4) Number of farm failures prevented
1932	0	---	---	---
1933	17	2,556,224	-11.2	28630
1934	4	476,063	-11.2	5332
1935	4	623,558	-11.2	6984
1936	0	---	---	----
		Total number of farm failures prevented, 1933-1935		40,946

Table 5b
Maximum Estimated Effects of State Moratoria
on Farm Failures, 1932-1939

Year	(1) Number of states with moratoria in effect	(2) Number of farms in states with moratoria in effect	(3) $\frac{\delta FAIL}{\delta MOR}$	(4) Number of farm failures prevented
1932	0	---	---	---
1933	17	2,556,224	-11.2	28,630
1934	21	3,074,376	-11.2	34,433
1935	18	2,476,295	-11.2	27,735
1936	16	2,059,741	-11.2	23,069
1937	4	414,087	-11.2	4,638
1938	1	114,224	-11.2	1,279
1939	0	---	---	---
		Total number of farm failures prevented, 1933-1938		119,784

column (1): Source: See source for MOR in Table 2.
column (2): Source for 1935 is the U.S. Census of Agriculture. Numbers for noncensus years are estimated by linear interpolation between census years.
column (3): Estimated regression coefficient from Table 3.
column (4): [column (3)]x[column (4)]/1000

Table 6a
Minimum Estimated Effects of Agricultural Adjustment Administration Programs on Farm Failures, 1933-1940*

Year	(1) REARN	(2) Change in REARN due to AAA (A)	(2) Change in REARN due to AAA (B)	(3) $\frac{\delta FAIL}{\delta REARN}$	(4) Change in FAIL due to change in AAA (A)	(4) Change in FAIL due to change in AAA (B)	(5) Number of farms in the U.S.	(6) Number of farm failures prevented (A)	(6) Number of farm failures prevented (B)
1932	44.75	---	---	---	---	---	---	---	---
1933	51.33	6.58	1.24	-.406	-2.67	- .50	5,838,605	15589	2919
1934	63.91	12.58	4.21	-.389	-4.89	-1.64	5,967,350	29180	9786
1935	72.20	8.29	5.40	-.361	-2.99	-1.95	6,096,604	18229	11888
1936	81.58	9.38	2.71	-.344	-3.23	- .93	5,987,977	19341	5569
1937	86.89	5.31	3.46	-.320	-1.70	-1.11	5,879,860	9996	6468
1938	77.00	-9.89	4.55	-.302	+2.98	-1.37	5,771,743	-17200	7907
1939	81.87	4.87	7.61	-.333	-1.62	-2.53	5,663,626	9175	14329
1940	85.87	4.00	7.22	-.320	-1.28	-2.31	5,555,508	7111	12833
					Total number of farm failures prevented, 1933-1940			91,421	14,329**

* In columns (A) we assume that all changes in farm income after 1932 were the result of AAA programs. In columns (B) we assume that the only effect of AAA programs on farm income was through direct government payments.
** Maximum of the entries in column (6B).

column (1): See Table 2 for definition and sources.
column $(2A)_t$ = column $(1)_t$ - column $(1)_{t-1}$.
column $(2B)_t$ = difference between $REARN_t$ with and without government payments.
column (3): Estimated regression coefficients from Table 3 are used to calculate these long run dynamic effects. The presence of the interactive earnings terms necessitates some assumption concerning the "long run equilibrium" levels of $REARN_t$. In this table, we assume that the equilibrium value of $REARN_t$ was $REARN_{t-1}$.
column (4) = [column (3)]x[column (2)]
column (5): Source for 1935 and 1940 is the U.S. Census of Agriculture. Numbers for noncensus years are estimated by linear interpolation between census years. To better approximate the number of farms that could be mortgaged, we delete the number of farms operated by sharecroppers from the census figures. This procedure was first suggested in USDA, Hiecking (October 1927, p. 35).
column (6) = [column (4)]x[column (5)]/1000

Table 6b
Maximum Estimated Effects of Agricultural Adjustment Administration Programs on Farm Failures, 1933-1940*

Year	(1) REARN	(2) Change in REARN due to AAA (A)	(2) (B)	(3) δFAIL/δREARN (A)	(3) (B)	(4) Change in FAIL due to change in AAA (A)	(4) (B)	(5) Number of farms in the U.S.	(6) Number of farm failures prevented (A)	(6) (B)
1932	44.75	---	---	---	---	---	---	---	---	---
1933	51.33	6.58	1.24	-.406	-.406	- 2.67	- .50	5,838,605	15589	2919
1934	63.91	19.16	4.21	-.406	-.389	- 7.78	-1.64	5,967,350	46426	9786
1935	72.20	27.45	5.40	-.406	-.361	-11.14	-1.95	6,096,604	67916	11888
1936	81.58	36.83	2.71	-.406	-.344	-14.95	- .93	5,987,977	89520	5569
1937	86.89	42.14	3.46	-.406	-.320	-17.11	-1.11	5,879,860	100604	6468
1938	77.00	32.25	4.55	-.406	-.302	-13.09	-1.37	5,771,743	75552	7907
1939	81.87	37.12	7.61	-.406	-.333	-15.07	-2.53	5,663,626	85351	14329
1940	85.87	41.12	7.22	-.406	-.320	-16.69	-2.31	5,555,508	92721	12833
						Total number of farm failures prevented, 1933-1940			573,679	71,699

* In columns (A) we assume that all changes in farm income after 1932 were the result of AAA programs. In columns (B) we assume that the only effect of AAA programs on farm income was through direct government payments.

column (1) = See Table 2 for definition and sources.
column $(2A)_t$ = column $(1)_t$ - column $(1)_{1932}$.
column $(2B)_t$ = difference between $REARN_t$ with and without government payments.
column (3) = Estimated regression coefficients from Table 3 are used to calculate these long run dynamic effects. The presence of the interactive earnings terms necessitates some assumption concerning the "long run equilibrium" levels of $REARN_t$. In this table, we assume that the equilibrium value of $REARN_t$ was $REARN_{1932}$ for columns (A) and $REARN_{t-1}$ for columns (B).
column (4) = [column (3)]x[column (2)]
column (5) = Source for 1935 and 1940 is the U.S. Census of Agriculture. Numbers for noncensus years are estimated by linear interpolation between census years. To better approximate the number of farms that could be mortgaged, we delete the number of farms operated by sharecroppers from the census figures. This procedure was first suggested in USDA, Hiecking (October 1927, p. 35).
column (6) = [column (4)]x[column (5)]/1000