Factors Influencing the Currentness of Debt Payments for Ohio Commercial Farmers

ESO #1291

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Earlier studies of farm financial stress have linked that concept to farmers' debt-to-asset ratios as a prelude to determining the incidence of stress with respect to farm size (Melichar) and with respect to socioeconomic characteristics of farmers (Lines and Zulauf). The results of those studies suggest that nearly one-third of large and medium sized farmers may be experiencing financial stress (Melichar, p. 9) and furthermore, that farmers who have higher gross sales and a smaller ownership interest in land operated are more likely to be financially stressed (Lines and Zulauf, p. 97).

Jolly et al. assess the incidence of financial stress by examining the joint criteria of debt-to-asset ratio and the occurrence of negative cash flow. Their findings indicate that, in 1984, nearly 13 percent of farm operators nationwide had debt-to-asset ratios in excess of 40 percent and a negative cash flow (Jolly et al., p. 1109). This group held 14 percent of total farm assets and 46 percent of total farm debt.

These studies provide insights into the potential structural impacts of financial stress but the measures they use do not completely describe the incidence of financial stress in U.S. agriculture. A high debt-to-asset ratio, for example, may be an indication of superior financial management rather than adverse economic conditions. Likewise, a negative cash flow may indicate a management decision to build inventory in anticipation of higher commodity prices in the future (Lins). Furthermore, the measures imply alternative definitions of financial stress.

The purpose of this paper is to examine the characteristics of Ohio commercial farmers who are unable to meet their debt service requirements. The study adopts the definition of financial stress as a "perceived inability to meet planned cash flow commitments" (Brake, p. 953). One of the most important of these commitments is debt service. Regardless of a farmer's leverage position, failure to service existing debt obligations can result in foreclosure. Indeed, firms unable to meet cash obligations are technically insolvent (Van Horne, p. 343). Thus, the inability to meet debt service requirements is considered to be an indication of financial stress.

The Debt-to-Asset Ratio, Debt Servicing Ability and Financial Stress

As noted by Lines and Zulauf, the debt-to-asset ratio is a measure of the relative claim which debt has on the earnings generated by assets. The greater the claim (i.e., the higher the debt-to-asset ratio), the greater the likelihood that realized earnings may be inadequate to meet cash flow commitments. But this use of the debt-to-asset ratio as an indicator of financial stress is limited to the case where returns to assets decline and the firm is forced to meet its debt service requirements from a smaller pool of earnings. In this sense, the debt-to-asset ratio is a measure of the potential for negative financial leverage.

The recent financial history of the farm sector, however, is dominated by a sizeable decline, since 1980, in the value of farmland (nearly 35 percent in Ohio). Thus, the debt-to-asset ratios of many farm businesses rose through a decline in the market value of existing

farmland holdings rather than through an expansion of debt. And, because the rate of current earnings generated by farmland has not fallen nearly as much as the value of farmland, the debt servicing ability of many farm businesses may not have been impaired, despite a rise in their debt-to-asset ratios.

For example, assume a farmer whose assets consist entirely of 200 acres of farmland. This farmland had a market value of $1,680 per acre when purchased in 1980. At that time, the farmer's debt-to-asset ratio was 80 percent. The mortgage used to finance the farmland called for interest at 10.5 percent. Had the land maintained its value at 1980 levels, the farmer's debt-to-asset ratio in 1985 would have been 77 percent, reflecting the amortization of $9,152 of principal. But, farmland values fell by 33 percent from 1980 to 1985. Thus, the farmer's debt-to-asset ratio was 115 percent in 1985.

Cash returns to land, reflected in cash rents, were $72 per acre in 1980. This figure was virtually unchanged in 1985. The variable interest rate had risen to 12.25 percent by 1985. Thus, despite the 44 percent rise in the debt-to-asset ratio, the ability of the farmer to service his mortgage was only slightly impaired. Moreover, this ability had nothing to do with the debt-to-asset ratio per se.

This example is not meant to suggest that the debt-to-asset ratio is not a measure of financial stress. Clearly, the farmer is less wealthy, has moved closer to insolvency and is less able to bear risk.

Data and Methodology

A stratified random sample of 2,500 Ohio farm operators was contacted via the mail during August, 1985. Sample stratification was performed to limit the sample to commercial farmers. Farmers received questionnaires only if acres farmed exceeded 220 or if major livestock enterprises were included on the farm. Four hundred and eight surveys were returned, a response rate of 16.3 percent. Of those returned, 382 were usable.

To determine how representative the survey respondents were of Ohio agriculture, selected sample characteristics were compared to 1982 Ohio Census of Agriculture data. Although the sample average age was close to the average reported in the 1982 Ohio Census of Agriculture, the sample had smaller percentages of farmers under 25 years of age and farmers older than 55 years. The survey included a larger percentage of part owners than the 1982 Ohio Census of Agriculture. This may be largely explained by the stratified sampling technique which excluded smaller operations, although response to survey questions revealed that the number of full owners had decreased between 1982 and 1985.

The average size farm operated by the respondents was 518 acres. The predominant size class was 260-499 acres, containing 38 percent of sampled farms. Only 9 percent of the respondents farmed more than 1000 acres. Other descriptive measures of the sample are included in Table 1.

Presented in Table 2 are various balance sheet measures elicited from the sample respondents. On average, the respondents estimated total farm debt to be $158,414, and the value of total assets to be $460,098.

Twenty five percent of the respondents had no debt, while 7 percent had in excess of one-half million dollars of debt. Thirty-nine percent of the respondents were in the $250,000 to $499,999 total asset class.

The average debt-to-asset ratio of the operators responding to the survey was 39 percent. Nearly 58 percent of the farmers had a debt-to-asset ratio less than 40 percent. About 19 percent of the farmers make up the 41 to 70 percent debt class. These farmers own about 21 percent of the farm assets, but owe over 33 percent of the farm debt. The very highly levered farms, with debt-to-asset ratios greater than 70 percent debt, make up 23 percent of all farms in the survey, own 18 percent of all farm assets, but owe over one-half of the farm debt. Nearly 8 percent of the farms indicated a negative net worth. Because farmers were asked to indicate only the values of assets and liabilities, errors of valuation are likely. However, a recent survey of lenders in Ohio indicated a similar percentage of farm borrowers with negative net worth.

Multivariate Analysis

This section presents a multivariate analysis of the relationship between currentness of payments and selected socioeconomic characteristics obtained from the survey. Currentness of loan payments is perhaps the best readily available measure of financial stress. Farmers who are not current in loan payments are likely candidates to exit farming. Farmers who indicated zero debt were eliminated from the analysis.

The dependent variable (whether a farmer is or is not current in debt service) is dichotomous in form, therefore a binary-choice model must be used. Alternative techniques for analysis of qualitative

dependent variables include discriminant analysis, and probit and logit regressions.

One of the basic assumptions for discriminant analysis is that the independent variables have a multivariate normal distribution (Klecka). When this assumption is violated, the discriminant function can yield misleading results regarding the significance of a coefficient (Press and Wilson; Halperin, et al.). The probit and logit models are quite similar in form. The probit regression is restricted to the cumulative normal probability function form, while the logit model is based on the cumulative logistic probability function (Pindyck and Rubinfeld). Capps and Kramer, in a comparison of the empirical performance of logit and probit regression models, concluded that "the differences in empirical performance between the respective models were indeed minimal" (p. 58). The logit model, however, is easier to estimate, and was chosen for this analysis.

Currentness of Payments Model

The likelihood of being delinquent is hypothesized to be affected by the farmer's debt-to-asset ratio, years of farming experience, percent of acres farmed that are owned, and the average interest rate paid. Debt-to-asset ratio was hypothesized to be positively related to noncurrent payment status. As the debt-to-asset ratio increases through expansion of debt, the amount of fixed obligations in the form of principal and interest payments also will increase, and the likelihood of debt service falling into arrears will increase.

Weighted interest rate on total farm debt is hypothesized to be positively related to delinquency. As interest rates rise, ceteris paribus, total interest payments increase, and thus size of the cash flow obligation will increase.

Experience was hypothesized to be negatively related to financial stress. This measure is included to control for a variety of factors associated with age or date of entry into farming which may be omitted from the model. For example, the life cycle view of farming suggests that goals and objectives change over the course of the farmer's life, with older farmers more likely to be in a consolidation stage and younger farmers more likely to be in an expansion stage.

Percent of total assets that consist of land reflects the asset structure of the firm. A negative relationship is hypothesized between this variable and the financial stress measure. This is to suggest that, for a given debt-to-asset ratio in 1985, a farmer with a large percentage of assets held as land is expected to have lower relative debt service requirements than a similar farmer with a smaller relative investment in land. To illustrate the logic of this hypothesis, let us examine a hypothetical case with 100 percent of assets as land. Because of the decline in land values since 1981, the debt-to-asset ratio for this case farmer would have increased substantially, assuming all other factors constant, doubling with a 50 percent decline in land values. However, this change is due entirely to changes in the value of assets. The numerator in the debt-to-asset ratio is unchanged by the market decline in land values. The size of the farm business, measured in physical

units, also is unchanged. Hence, changes in the debt service ability of this farmer would be due entirely to changes in the cash flow of the operation.

The equation estimated was:

LOG P = -8.3980 + 2.9551 LEVERAGE + .0408 EXP + .2304 WINT + .0241 PERTLA

(2.1878)*** (.7172)*** (.0205)** (.1428)* (.0147)*

where LOG P = log of probability of being noncurrent,

LEVERAGE = debt-to-asset ratio,

EXP = years of farming experience,

WINT = weighted interest rate on debt, and

PERTLA = percent of total assets that consist of real estate.

The numbers below the regression coefficients are standard errors. One, two and three asterisks indicate significance levels of 0.1, 0.05 and 0.01, respectively. Just over 78 percent of the observations were correctly categorized by the equation.

The regression coefficient for debt-to-asset ratio is positive and significant at the 0.01 level of probability (figure 1). This result supports the conclusion that a high debt-to-asset ratio indeed is related to cash flow problems. However, the reader is cautioned to recall that percent of assets that are land is controlled for in this analysis, and hence the differential impact of land ownership on leverage is constant.

The regression coefficient for weighted interest rate is positive and significant at the 0.10 probability level. This indicates that as interest rate paid increases, all other factors constant, the likelihood of delinquency in debt payments increases.

The coefficient for experience is positive, and thus contradicts the hypothesized relationship. It is significant at the 0.1 level of probability. The interpretation is that holding all other explanatory variables constant, higher levels of experience are associated with a higher probability of delinquency. Two important factors concerning the procedure for the analysis may explain the reversal of sign from that expected. The first relates to the leverage position. All farmers without debt were excluded from the analysis. The leverage position of the farmers included in the analysis was controlled. Because leverage position is highly correlated with experience, a major influence on experience has been controlled. Secondly, farmers with longer experience also may have older debt obligations with lower interest rates. However, this variable, too, is controlled in the analysis. Hence, it is not too surprising that the coefficient is not highly significant or that its sign is reversed from that expected.

The most interesting result in the model pertains to the percent of total assets that consist of land. This coefficient is positively related to the likelihood of delinquency and is significant at the 0.10 level of probability. The estimated relationship is opposite in sign to that hypothesized. There are several reasons why this may have occurred. The most likely explanation relates to the illiquid nature of real estate assets and the management of reserve credit as a response to risk. If a farmer has reserve credit in the form of net worth in land ownership, this reserve cannot be tapped easily. To convert this reserve credit to debt requires that the mortgage be refinanced or that a second mortgage

instrument be used. This option may have high costs, however, arising from loan closing costs and potential increases in interest rates from those of the previous debt instrument. This option also requires that the lender be willing to accommodate the transaction, something that may not be assured in a time of falling land values and expectations of low future farm profitability and continued land value declines. A second method of extracting this credit reserve may be to cease making principal and interest payments, thereby lessening cash flow requirements by allowing loan principal balances to rise. This latter strategy is feasible only if farmland owners perceive that foreclosure due to delinquency is not imminent. Such expectations may be reasonable, at least for farmers with lower debt-to-asset ratios. This argument suggests that the delinquency measure (dependent variable) used in this analysis is not a complete measure of financial stress, at least to the extent that stress is related to the likelihood of foreclosure.

An Alternative Formulation

The debt-to-asset ratio often is used as an indicator of financial stress. Recent literature suggests that a farm with a debt-to-asset ratio of 40 percent or less be considered to be financially sound and likely to weather the current financial stress period, while farms with debt-to-asset ratios exceeding 40 percent are considered financially stressed (Melichar). Because of the frequent reference to the 40 percent debt-to-asset ratio as a demarcation between those experiencing or not experiencing financial stress, the logit model formulation was altered to examine this issue. The model and estimated coefficients are:

$$\begin{aligned} \text{LOG P} = {} & -7.5582 + .2339\ \text{LEV40} + 1.3240\ \text{LEV50} + 1.7157\ \text{LEV60} \\ & \quad (2.1221)^{***} \quad (.9041) \quad\quad (.7748)^{*} \quad\quad (.7293)^{***} \\ & + 1.7828\ \text{LEV70} + .0357\ \text{EXP} + .2609\ \text{WINT} + .0202\ \text{PERTLA} \\ & \quad (.5733)^{***} \quad\quad (.0204)^{**} \quad (.1430)^{**} \quad\quad (.0138) \end{aligned}$$

where LOG P = log of probability of noncurrent debt payments

LEV40 = 1 if D/A is between 41 and 50; 0 otherwise,

LEV50 = 1 if D/A is between 51 and 60; 0 otherwise,

LEV60 = 1 if D/A is between 61 and 70; 0 otherwise,

LEV70 = 1 if D/A is over 70; 0 otherwise,

EXP = years of farming experience,

WINT = weighted interest rate on debt, and

PERTLA = percent of total assets that consist of real estate.

Instead of measuring debt-to-asset ratio as a continuous variable, a series of binary variables were created to divide observations into debt-to-asset ratio classes. Farmers with zero debt were excluded. Those with debt-to-asset ratios less than 40 percent are in the intercept term.

The regression coefficients for other independent variables did not change in sign and varied little in value from those in the previous model formulation. The model correctly classified 76 percent of the farmer observations.

The regression coefficients for the binary variables are interpreted as the shifting of the probability function due to alternative leverage positions (figure 2). As such, the coefficients can be viewed as a test of difference of the probability of noncurrent payments for those observations in the particular class from those in the intercept term (a

debt-to-asset ratio of less than 40 percent). Those individuals classified into the 41-50 percent debt-to-asset class statistically were no different in delinquency than those in the intercept. The regression coefficients for the 51-60 percent debt-to-asset ratio were significantly different from the intercept at the 0.10 significance level. The regression coefficients for the binary variables LEV60 and LEV70 were significantly different from the intercept term at the 0.01 level of probability. These results may be interpreted as evidence that the demarcation ratio of debt-to-assets is higher than 40 percent.

Summary and Conclusions

Ohio commercial farmers were surveyed to collect data relative to current farm financial structure and delinquency rates on farm debt. A multivariate analytical method was used to estimate the relationships between currentness of debt payments and selected farm and farmer characteristics. Two important conclusions were reached. The first relates to differences in the delinquency rates for farmers with different levels of intensity of land ownership. Farmers with relatively large land ownership relative to total asset ownership are more likely to be delinquent in loan payments. An argument was furthered, however, that these farmers should be less likely to be delinquent, all other things equal. This suggests that additional research is needed to ascertain the true nature of this relationship. The second conclusion relates to the common use of the 40 percent debt-to-asset ratio as a demarcation between those who are likely to survive and those who are likely to fail as a result of the financial stress period. If the delinquency rate is a good measure of

those farmers likely to be foreclosed upon in the near future, then statistical evidence indicates this demarcation may be at higher debt-to-asset ratios.

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Table 1: Selected Farm and Farmer Characteristics for the Surveyed Farmers.

Farm and Farmer Characteristics	Debt to Asset Ratio						
	0	1-20	21-40	41-70	71-100	100+	Total
Number	84	57	46	62	49	25	323
Age	60.3	54.6	45.1	43.2	41.8	41.3	49.6
Experience	37.5	33.2	23.8	21.1	21.2	21.3	27.9
Acres operated	367	446	513	585	589	745	507
Acres owned	262	303	221	214	182	174	235
Acres cash leased	40	99	216	328	207	300	176
Acres share leased	67	54	82	131	200	272	115
Off-farm income	$8,633	$8,244	$9,179	$13,173	$7,445	$10,297	$9,462
Off-farm employment:							
Operator or spouse	50.7	50.9	68.2	65.8	66.7	64.0	59.5
Operator only	42.5	34.6	45.5	49.2	37.5	56.0	43.1
Spouse only	28.8	36.4	38.6	44.3	45.8	32.0	37.3

Table 2: Selected Balance Sheet, Income and Expense Measures for the Surveyed Farmers.

Farm and Farmer Characteristics	Debt to Asset Ratio						
	0	1-20	21-40	41-70	71-100	100+	Total
Number	84	57	46	62	49	25	323
Assets:							
Real estate	$326,008	$395,807	$290,326	$309,737	$271,755	$189,900	$311,356
Nonreal estate	124,875	143,595	155,720	196,185	124,993	119,292	145,845
Total	450,883	539,402	446,046	505,922	396,748	309,192	457,201
Percent of assets in land	72.3	73.4	65.1	61.2	68.5	61.4	67.9
Liabilities:							
Real estate	$ 0	$31,756	$80,591	$175,175	$225,694	$230,870	$102,814
Nonreal estate	0	15,839	50,618	100,160	98,073	168,228	57,128
Total	0	47,595	131,209	275,335	323,767	399,098	159,942
Percent of debt in land		66.7	61.4	63.4	69.7	57.9	47.8
Net worth	$450,883	$491,807	$314,837	$230,587	$ 72,981	$(89,906)	$297,258
D/A (percent)	0.0	8.8	29.4	54.4	81.6	129.1	38.6
Percent current in payments:							
Real estate debt		97.1	100.0	88.9	75.6	55.6	86.8
Nonreal estate debt		84.4	86.9	76.8	71.1	56.5	77.3
Reported interest rates:							
Real estate		9.8	11.0	11.6	12.5	12.3	11.3
Nonreal estate		12.3	12.6	12.2	12.5	12.9	12.4

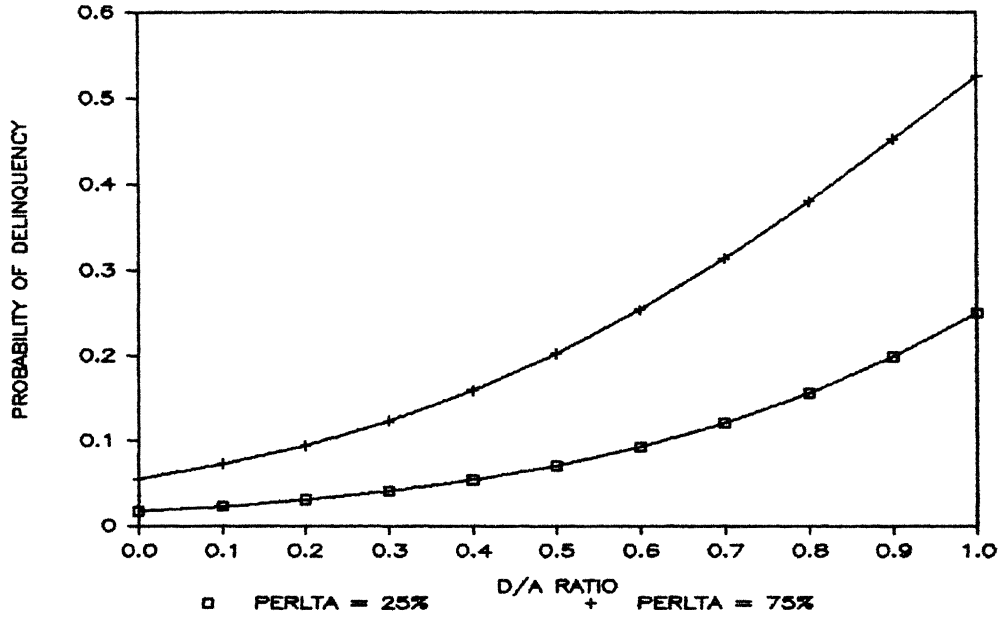

Figure 1: Estimated Relationship Between Currentness of Debt Payments and Leverage Position for the Levels of Real Estate Value to Total Asset Value Percentage.

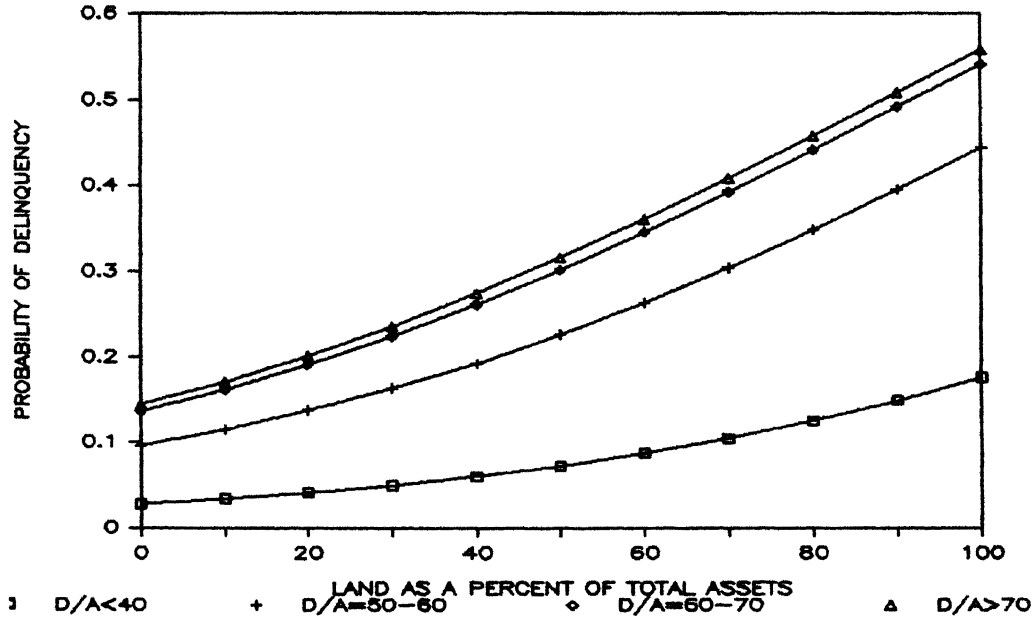

Figure 2: Estimated Relationship Between Currentness of Debt Payments and Real Estate Value to Total Asset Value Percentage for Four Leverage Positions.