Farm Financial Performance from Borrower and Lender Perspectives

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Abstract

This study answers how profitability changes from a lender and borrower perspective. Using the FBFM data for periods from 1995 to 2004, we find that the variables that explain the profitability of a lender and borrower differ. Further, doing the regression according to categories, gives us different results in the significance of the explanatory variables.

Key Words: debt-to-farm operating income, profitability, repayment capacity, ROE.

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Up to now no literature has differentiated between the profitability approach of lender and borrower and how these differ with strategies employed by farmers. The research that has been done, analyzed how performance and profitability changes with key strategies employed by farmers or how their risk management strategies are affected by structural characteristics. But these researches did not differentiate between a lender and borrower perspective. Instead, they analyzed which variables really define the profitability measure or the risk measure of farmers. Only a research done by Zech and Pederson (2003) looked at the risk side of lenders and borrowers.

This paper, will consider how profitability relationship changes according to borrower and lender perspective. For borrower perspective, profitability can refer to ROA as well as ROE. ROA is the profit measure before paying debt, whereas ROE is the profitability measure after paying debt. This study, will concentrate on ROE as the proxy for the profitability measure of borrower and repayment capacity, measured by debt to farm operating income as the proxy for the profitability of lender. This paper will also look at how profitability changes for the borrower in different ROE categories, and in different machinery investment categories, as well as how profitability changes for the lender in different debt-to-farm operating categories, and in different ROE categories.

Literature Review

Income generation and risk management strategies have always been an issue for farmers. Many studies have been done in regards to these.

In 1996 US Farm Bill became effective for farmers. After the 1996 Farm Bill, there was high income variability for grain farms. Many studies have been done to analyze the strategies that affect the income of the farmers or their financial performance after the 1996 Farm Bill. Escalante and Barry (2002) looked at key strategies employed by grain farms to prevent deterioration of their equity growth rate after 1996 Farm Bill by using FBFM data for periods 1996 to 1999. The main strategies they focused on were financial management, asset management, cost reduction, and revenue enhancement. By using an OLS regression on cross sectional data for four year average values, Barry and Escalante (2002) found that effective reductions in borrowing costs could significantly enhance equity growth; farms with productive assets are more likely to grow faster; family living expenditures negatively affect the farm equity growth; and off-farm incomes supplement the low farm income. Another study done by Hennings and Katchova (2005) extended the study of Barry and Escalante (2002) for the data from 1995 to 2003 and applied quantile regression approach rather than an OLS approach to analyze the effects of various strategies employed by farmers to maintain equity positions. They found that Escalante and Barry (2002) overlooked the possibility that farms at different points in the distribution of equity growth may actually have different effects from the financial management, asset management, cost reduction, and revenue enhancement strategies. That is cost reduction and revenue enhancement strategies have a higher impact on higher quantiles, and financial management strategies have a positive effect for farms situated in the highest quantile of equity growth, however a negative effect for farms in the lowest quantile. In addition, they found that high equity growth farms make better use of their assets to generate revenues than do low equity growth

farms. Another study done by Mishra, El-Osta and Steele (1999) looked at the factors affecting the profitability of limited resource farms and other small farms after the 1996 Farm Bill.

In addition to these, some other studies looked at tenure and its effect on financial performance. A study by Barry and Ellinger (1987) analyzed the relation of tenure position to ROA, ROE, debt-to-asset ratio, and acres. They found that farm operators with higher ratios of leased to owned land have higher accounting returns as well as higher leverage positions. Also, as tenancy increases, farm size as measured by acres also increases.

Other than the income generation strategies, risk management in agriculture was also the main analysis topic for some studies. A study done by Barry, Escalante and Bard (2001) looked at how variability of net farm income is influenced by farm size and other structural characteristics by using farm level data from FBFM over 1980-1996 period. They found that under cross sectional model, relative variability of real net farm income is not significantly influenced by farm size, measured by either acreage or value of farm production, nor by age or diversification index for different farm types. Under a time series/cross section model, periodic variations in farm size, along with differences in relative crop prices received, crop yield, and degree of diversification can significantly influence changes in farm income variability based on geographic location of farms. Another study done by Zech and Pederson (2003) looked at important factors that should be used by lenders in risk rating their farm customers. They did an OLS and logistic regression for farm performance and debt repayment ability. For farm performance, they used net worth growth ratio as a proxy and for debt repayment ability they used term debt

coverage ratio as a proxy. They found that debt-to-asset ratio is the best indicator for repayment capacity and should be one of the variables to be included in risk rating models, and that asset turnover ratio and living expenses are the best indicators for net worth growth.

Methodology and Model Specification

This section outlines the points that were considered to construct the variables used in this study. For both lender and borrower, the profitability is expressed through four to five strategies, which are asset management, cost reduction, financial management, and revenue enhancement. In addition, for lender another factor, age which may reflect the responsibility level of the borrower, is considered.

Asset management strategy refers to efficiently using the farm assets, and translating these assets into high returns. Financial management strategy refers to managing the farm's debt and equity position efficiently. Cost reduction refers to selection of cost efficient strategies to increase the operational efficiency. Revenue enhancement refers to increasing farm revenues through marketing strategies, or using off-farm funds to increase the efficiency in the farm such as through investment in new machines, or fertilizers to make soil more productive and etc.

The independent variables for the borrower and lender can be grouped under these strategies. However, the independent and dependent variables for the lender and borrower are different. For the borrower, ROE measures the profitability, whereas for the lender the profitability depends on whether the farmer has repaid his loan or not, that is the repayment capacity. Since we do not have lender data, the repayment capacity from farm

level data is taken as proxy for analyzing the profitability of the lender. According to FBFM classification, the repayment capacity can be measured by capital replacement and term debt repayment margin, or debt-to-farm operating income ratio. Since we used ratios for most of our variables, in order to be consistent with measurement of the variables, and to prevent the size of the farm effect, we chose the debt-to-farm operating income ratio, which is a ratio measure rather than a dollar measurement.

Table 1 and table 2 present the description of the variables as well as their expected signs. The explanation below can be made regarding the borrower perspective.

The effectiveness of asset management strategies for the borrower can be observed through the asset turnover ratio, tenure ratio, cash lease ratio, machinery investment ratio, and acres. Asset turnover ratio measures the efficiency of asset utilization. The higher this ratio, more effectively are assets used to generate profits; that is, the farmer is financially efficient. It is expected that idle resources can lead to lower ROE value. Tenure ratio shows how much of the land is owned. As previous study by Barry and Ellinger (1987) indicated, with tenure ratio increasing, the current ROE decreases since most of the asset is tied to land and the farmer does not generate sufficient cash flow from the land itself to meet the annual debt payments. Rather, a larger portion of the total ROE occurs as unrealized capital gains on farmland. One strategy to increase current portion of the ROE might be to lease more, rather than owning the land. In order to see whether different types of leasing affect the strategy of the borrower, we also included cash lease ratio as a variable. Further, previous studies show that as farm size increases machinery investment per acre declines (http://www.farmdoc.uiuc.edu/finance/FinancialCharacteristics/index9.htm). Also,

previous studies show that higher ROE is associated with larger farm size (http://www.farmdoc.uiuc.edu/finance/FinancialCharacteristics/index6.htm). Then, we would expect to see a negative relationship between machinery investment and ROE. In addition, farmer might prefer to benefit from economies of scale or scope to enhance the ROE. To do this, he might need more area to plant. Thus, one strategy is to increase the acres farmed. Overall, the above variables are potentially good proxies to understand how asset management strategy of the borrower affects his ROE.

The effectiveness of financial management strategies for the borrower can be observed through current ratio, debt-to-asset ratio, debt-to-farm operating income ratio, and net worth. Current ratio is a liquidity indicator. It shows the farmer's ability to meet short-run obligations. The higher this ratio, the more the farmer can meet its short-run obligations. As current ratio increases, this means less money is left for the borrower, which is less ROE since lender is paid.

A farmer also can use debt to increase into expected returns. However, higher debt levels do not necessarily turn into growth. Previous study by Escalante and Barry (2002), show that lower levels of debt increases profitability and higher levels of debt decreases profitability, implying a concave shape. Since the debt-to-asset ratio shows a nonlinear relationship with ROE, we also included debt-to-asset ratio squared as one of the independent variables for the borrower side to capture the nonlinear relationship. A quadratic relation implies that the function may increase and then decline. That is debt-to-asset ratio has a positive effect whereas the debt-to-asset ratio squared has a negative effect on the ROE. Further, debt-to-asset ratio measures the solvency of the farmer. By

including this variable we can analyze how solvency plays role in the financial management strategy of the farmer.

Debt-to-farm operating income ratio and debt-to-asset ratio are similar in what they measure. Debt-to-farm operating income ratio includes the income statement as well as balance sheet measures. This is also the ratio measurement for repayment capacity according to FBFM data classification. By including debt-to-farm operating income ratio, we can infer whether the repayment capacity is one of the strategies of the farmer to generate more return. We would expect to see a negative relationship between debt-to-farm operating income ratio and ROE. In addition to these, higher net worth may reflect greater ownership of farm land and a lower current ROE. Therefore, we need to analyze whether this is part of the strategy of the farmer to generate a higher ROE.

For the cost reduction strategy, lower family expenditure likely would enhance ROE. However, we should analyze whether this is really a consequence of high growth or one of the strategies of the farmer to enhance ROE. An increase in family expenditure ratio may suggest that families spend more on themselves, as a consequence of a higher ROE. However, a negative expenditure ratio may suggest a causal relationship between ROE and family expenditure.

For the revenue enhancement strategies, we can look at non-farm income ratio, and farm operating income-to-gross farm return ratio. Non-farm income can be used to generate more income to be used for farm production and, in return, to increase ROE. Alternatively, the borrower might prefer to pay his debt, rather than use this non-farm income to generate more return on equity. Farm operating income-to-gross farm return ratio measures the financial efficiency of the farmer. A positive relationship between this

ratio and ROE is anticipated. One strategy of the farmer can be to increase operating income which enhances the farm net worth. Some strategies might include effective marketing, using federal income subsidy support, and etc.

Another variable to consider is soil productivity[1]. Higher soil productivity and soil conservation practices are also factors that may increase/maintain production, and thus, ROE. An expectation of positive relation with ROE confirms with the previous studies such as Barry et al. (2001), and Mishra et al. (1999).

However, for lender the variables slightly differ since we only have farm-level rather than lender-level information available in FBFM data. One way to analyze profitability measure for lender is through understanding the repayment capacity of the borrower. In case the lender is paid, he generates profits. Therefore, it is better to include the following independent variables for the lender.

For understanding the effectiveness of financial management strategies; interest expense ratio, working capital to value of farm production ratio, net worth, ROE ratio, and debt-to-asset ratio can be good measures to focus. Interest expense ratio can be used to analyze the financial risk of the farm operation. The higher this ratio, the more risky is the farm operation and the more probability for a lower profitability for the lender. Therefore, we would expect to see a negative relationship between interest expense ratio, and debt-to-farm operating income. Working capital to value of farm production ratio shows the amount of working capital to the size of the operation. The higher this ratio, the greater is the liquidity to meet its current obligations. Thus, a positive relationship between working capital ratio and debt-to-farm operating income is expected. Net worth

[1] Soil productivity doesn't fall under asset management, revenue enhancement, cost reduction or financial management strategies.

measure, depending on asset values can be a good indicator whether the lender is going to be paid in case of insolvency, and a potential liquidation. Since net worth shows the ability to be paid by the borrower, we would expect to see a positive relationship between this variable and the debt-to-farm operating income ratio. ROE trend for the farm business can also give the lender an idea about whether he can be paid or not. If the farm business keeps a trend of increasing ROE with the return on assets staying the same, then this may mean that every return on asset is spent more on paying the equity holders and less on the lenders. Therefore, this variable can show negative effect on the profitability for the lender. In addition, as the borrower's debt increases, the lender is faced with more risk and this ratio would have a negative effect to debt-to-farm operating income ratio.

Asset turnover ratio can be a good proxy to understand the effectiveness of asset management strategies. Since we expect to see a positive relationship between ROE and asset turnover ratio, a negative relationship is expected between asset turnover ratio and debt-to-farm operating income ratio.

Family expenditure might be a good proxy for cost reduction strategies. Family expenditure of the borrower can give a good idea to the lender about the expenses of the borrower and the chances lender might be repaid. However, still this relation might depend on how this affects the ROE. If it affects ROE positively or as a consequence of ROE it is affected positively, then it would have a negative effect on the repayment capacity and vice versa.

Non-farm income can be a proxy for the revenue enhancement strategies. As the borrower gets revenue from off-farms, the better it is for the lender, especially in seasonal periods when return on crops can be low. However, the effect depends on how non-farm

income is used either to pay the debt or to pay the shareholders. If this variable increases the ROE, then it is expected to have a negative sign for debt-to-farm operating income.

Another variable to consider is the age of the borrower. This can indicate the responsibility level of the borrower. As people get older, they may care more about their reputation in society. They may be less eager to increase their return but instead use the money to make their payments. Therefore, we would expect a positive relationship between age and debt-to-farm operating income ratio.

Data and Descriptive Statistics

This paper uses FBFM data from 1995 to 2004 for grain farms with records that have been certified based on their balance sheet, family living sources and uses, and economic management analysis. When constructing our data, we first looked at the correlation matrix and found that multi-collinearity is not a problem since correlation coefficient between variables is less than absolute value of 0.7. In addition, to prevent outliers, mean plus/minus three standard deviations is applied for ROE, machinery investment, debt-to-farm operating income, current ratio, family expenditure, and non-farm income ratios. Even though we eliminated the values of debt-to-farm operating income variable that were beyond three standard deviations, some negative values resulted because of negative farm operating income. This caused inconsistency for our category formation. Therefore, we also eliminated the values of debt-to-farm operating income that were less than zero. Moreover, in order to eliminate farm size effect, we included most of the variables as ratios, except soil productivity, acres, net worth, and age. Further, since some of the data in the FBFM was based on percentages and some

was based on decimals, we divided the ROE, debt-to-asset ratio, farm operating income-to-gross farm return, and interest expense ratio by 100 for consistency with the decimal valued variables. Conducting the regressions in categories might also help to make the data more homogeneous. Categories were created for ROE, machinery investment, and debt-to-farm operating income ratios. In order to have enough sample size to make conclusions, we divided ROE, machinery investment, and debt-to-farm operating income into categories by max, upper quartile, median, lower quartile and minimum values. For instance, data between lower quartile and minimum values is considered category 1, data between median and lower quartile values is considered category 2, data between upper quartile and median values is considered category 3, and data between maximum and upper quartile values is considered category 4. By categorizing in this way, enough sample size is achieved for each category. Category 1 to 4 refers to lowest, low, high, and highest, respectively for both ROE, and machinery investment. Category 1 to 4 refers to highest, high, low, and lowest debt, respectively for debt-to-farm operating income ratio. In each case, farm under category 1 refers to the farm in the worst situation and farm under category 4 refers to the farm in the best situation.

Table 3 and 4 shows the mean values for the variables according to borrower perspective and lender perspective, respectively. For mean values based on ROE categories (Table 3), non-farm income ratio, and acres show linear trends, the rest of the variables either show a concave or convex trend. These patterns suggest that acres have positive relationship with ROE, whereas non-farm income ratio has negative relationship with ROE. Further, when we analyze mean values based on the investment category (Table 3), we see a negative linear relationship for asset turnover ratio, farm operating

income-to-gross farm return ratio, and a positive linear relationship for acres, debt-to-farm operating income ratio, net worth, cash lease ratio, and machinery investment variables. From previous studies (http://www.farmdoc.uiuc.edu), we know that ROE increases as farm size increases, and that investment per acre decreases as farm size increases. Therefore, we would expect to see that ROE decreases as machinery investment increases. The mean values for these variables are consistent with expectation considering that ROE decreases as investment increases, except the expectation for acres. For acres, we expect to see a negative relationship but we see that there is a positive relationship with machinery investment.

For mean values based on debt-to-farm operating income category (Table 4), we see that as debt-to-farm operating income decreases, working capital shows an increasing trend whereas interest expense ratio, family expenditure ratio, non-farm income ratio, and debt-to-asset ratio show a decreasing trend. However, we realize that the rest of the variables show a concave or convex trend, which we cannot make conclusion based on the mean values. When we analyze mean values based on ROE category (Table 4), we see that interest expense ratio and non-farm income ratio show a negative linear relationship as expected with ROE whereas the rest of the variables show a concave or convex trend.

Empirical Results

The results for the OLS regression based on all data as well as regression based on ROE, investment and debt to-farm operating income categories are presented in tables 5 and 6. Considering Table 5, the regression results based on all data, according to

borrower perspective supports the previous studies' results. Asset turnover ratio and machinery investment are significant variables for explaining profitability according to borrower perspective. In addition, debt-to-asset ratio, debt-to-asset ratio squared, cash lease ratio, and farm operating income-to-gross farm return ratio are also significant in explaining the profitability for the borrower. However, contradiction occurs with three of the previous' studies results. Zech and Pederson (2003) found that family expenditure ratio is significant in explaining profitability. Furthermore, Escalante and Barry (2002) showed that non-farm income ratio and family expenditure are significant in explaining the equity growth rate. In addition, Ellinger and Barry (1987) found that tenure ratio is significant for explaining rates of return. However, our results indicate that family expenditure ratio, tenure ratio, and non-farm income ratio are not significant variables. Further, all of the significant variables' signs are as expected, except the sign for machinery investment. We expect to see a negative sign for machinery investment; however, it is positive for regression based on all data.

However, the significance changes for the regressions based on ROE categories. Even though family expenditure ratio, tenure ratio, non-farm income ratio, acres, debt-to-farm operating income ratio and net worth are not significant for regression based on all data, these variables become significant under the farms categorization approach. For instance, family expenditure ratio, and acres become significant for farms that have lowest, low, high, and highest ROEs, whereas tenure ratio is significant for low, high and highest ROEs, and net worth significant for lowest, high and highest ROEs. The sign for tenure ratio is consistent with the expectations. However, the sign for family expenditure for the lowest, low and high ROE farms are negative, whereas it is positive for the

highest ROE farms. This might mean that family expenditure becomes an explanatory variable for lowest, low and high ROE farms, whereas it becomes a consequence of ROE for the farms that are in the highest ROE category. In addition, non-farm income ratio is significant for highest ROE farms, with positive coefficient. Debt-to-farm operating income ratio becomes important for low and highest ROE farms with positive coefficients, in which the positive sign is against the expectation.

Regression for the machinery investment categories, again show changes in significance. It becomes no longer an explanatory variable to explain farm profitability.

When we analyze table 6, the regression based on all data according to lender perspective, the debt-to-asset ratio is significant as the other studies found; however, the positive sign is not consistent with our expectations and with the negative relationships found in previous studies. One possible explanation is that higher debt means the borrower can renew his loans and can afford to borrow. That is, a financially strong farm can have a stronger repayment capacity. Further, interest expense ratio, working capital ratio, net worth, and family expenditure ratio are significant in explaining the repayment capacity of the borrower. Also, the signs are as expected for these variables, except the interest expense ratio, debt-to-asset ratio and the working capital ratio. The sign of the family expenditure is positive. Even though family expenditure ratio does not have a significant relationship with ROE for the borrower for regression based on all data, it is found to be significant for the lender. The positive coefficient for family expenditure for lender means that as a consequence of lender being repaid, the family living expenses increase. In addition to these, we see that age is not a significant variable for repayment capacity for the lender.

The regressions for ROE categories according to the lender perspective yield significant age variable for high ROE farms. Asset turnover ratio becomes significant for lowest, low and high ROE type of farms. Further, the working capital ratio loses its significance for the high and highest ROE type of farms. The coefficient for the working capital ratio for the lowest and low ROE farms is consistent with our expectations.

When we analyze the regression based on the debt-to-farm operating income categories for the lender, we see that asset turnover ratio gains its significance for the farms that have the low, high and highest debt; the coefficient signs are negative as expected. On the other hand, ROE gains its explanatory power for farms with low and high debt. In addition, non-farm income shows a positive coefficient for farms with high, and highest debt. Further, age explains the repayment capacity for farms with low and highest debt, whereas for regression based on all data we find that age is not a significant variable. The sign for age variable for these two types of farms are as expected, that is it has a positive and negative effect. In addition, just like we find for regression based on all data, the coefficients for the working capital ratio are negative, that contradicts with our expectations. Moreover, the positive coefficient that we find for debt-to-asset ratio for regression based on all data, continues the same trend when we do the regression under debt-to-farm operating income variables. Lastly, the trends for interest expense, net worth and family expenditure follow the same trends as the regression under all data.

Summary and Conclusions

This paper, considered how profitability changes according to a lender and a borrower perspective. Different management strategies to generate profits might help

regulators understand how profitability of farmers and lenders would be affected in case of a policy change. We tested whether asset management, financial management, cost reduction, and revenue enhancement strategies played important roles for both a lender and a borrower in generation of profits, but different components are applied for these strategies according to a borrower and a lender perspective.

When we look at the regressions according to borrower perspective, we find that financial management, asset management, and revenue enhancement strategies affect profitability of a borrower whereas cost reduction (such as family expenditure) strategies have no effect, unlike the effect of cost reduction strategy on the profitability of the lender. However, when we analyze farms with different ROE categories, we see that cost reduction strategy also becomes important in explaining the profitability according to borrower perspective. In addition to family expenditure, non-farm income (revenue enhancement strategy), acres, tenure (asset management effectiveness), net worth (financial management strategy), and debt-to-farm operating income ratio (financial management strategy) are also found to have no effect for regression based on all data for borrower. Moreover, our results indicate that age, asset turnover ratio, and ROE are not significant to explain the profitability from lender perspective. However, these become significant when regression is done based on categorization approach. For both lender and borrower, the regressions for different categories gave different components for revenue enhancement, financial management, and asset management strategies.

We believe that this study can be enhanced by focusing on a nonlinear relationship for the variables that show a concave or convex relationship in table 3 and table 4. In addition, we can try to analyze the differences for the profitability between

lender and borrower by using the same variables and seeing which ones are significant in both lender and borrower case.

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Table 1. Variable Definitions and Expected Signs According to Borrower Perspective

Variables	Definitions	Expected Sign
Asset turnover ratio[a]	Value of farm production / Average total farm assets	+
Family expenditure ratio	Family expense / Net income	+/-
Current ratio[a]	Current assets / Current liabilities	-
Tenure ratio	Owned acres / Total acres operated	-
Farm operating income-to-gross farm return ratio[b]	Farm operating income / Gross farm return	+
Non-farm income ratio[c]	Non-farm income / (Non-farm income + farm income)	+ / -
Machinery investment ratio	Machinery investment / Tillable acre	-
Soil productivity	Index from 1 to 100	+
Cash lease ratio	Cash lease / Total lease of acres	+
Debt-to-asset ratio	Debt / Total assets	+
Debt-to-asset ratio squared	(Debt-to-asset ratio)^2	-
Acres	Operated acres	+
Debt-to-farm operating income ratio	Debt / Farm operating income	-
Net worth[a]	Fair market value of assets - Fair market value of liabilities	-

[a]These values are as given in FBFM data

[b]Value of farm production=Gross farm return

[c]Non-farm income = wages + interest & dividends + other non-farm income

Table 2. Variable Definitions and Expected Signs According to Lender Perspective

Variables	Definitions	Expected Sign
Interest expense ratio[b]	Total interest expense / Gross farm return	-
Asset turnover ratio[a]	Value of farm production / Average total farm assets	-
Working capital ratio[ab]	Working capital / Gross farm return	+
Net worth[a]	Fair market value of assets - Fair market value of liabilities	+
ROE[a]	Net farm income / Average farm equity	-
Age	Operator's age	+ / -
Family expenditure ratio	Family living expenses / Net income	+ / -
Non-farm income ratio[c]	Non-farm income / (Non-farm income + farm income)	- / +
Debt-to-asset ratio	Debt / Total assets	-

[a]These values are as given in FBFM data.

[b]Value of farm production=Gross farm return

[c]Non-farm income = wages + interest & dividends + other non-farm income

Table 3. Mean Values for Variables According to Borrower Perspective

		Investment Categories[a]				ROE Categories[b]			
Variables	All	Inv1	Inv2	Inv3	Inv4	ROE1	ROE2	ROE3	ROE4
ROE	0.10	0.15	0.08	0.08	0.10	-0.11	0.03	0.09	0.42
Machinery Investment ratio	51.80	2.81	28.31	59.93	116.19	53.52	56.44	54.61	42.62
Current ratio	3.79	4.17	3.35	3.95	3.68	3.46	5.22	4.01	2.46
Debt to asset ratio	0.33	0.34	0.33	0.32	0.34	0.37	0.24	0.29	0.44
Debt to asset ratio squared	0.16	0.17	0.16	0.14	0.15	0.19	0.09	0.11	0.23
Asset turnover ratio	0.37	0.39	0.38	0.35	0.35	0.36	0.23	0.31	0.56
Farm operating income to gross farm return ratio	0.24	0.31	0.23	0.21	0.21	0.12	0.22	0.29	0.32
Cash lease ratio	0.34	0.31	0.32	0.35	0.39	0.36	0.33	0.33	0.36
Tenure ratio	0.22	0.23	0.21	0.21	0.22	0.22	0.33	0.23	0.10
Family expenditure ratio	1.55	1.33	1.74	1.57	1.57	3.49	1.13	0.78	0.81
Soil productivity	84	83	84	84	83	83	84	83	84
Non-farm income ratio	0.17	0.14	0.19	0.18	0.18	0.29	0.18	0.13	0.10
Acres	737	648	706	758	835	583	731	811	821
Debt-to-Farm Operating Ratio	10.60	6.64	10.34	10.99	14.45	26.03	6.90	4.68	4.80
Net worth	815,031	644,026	732,568	886,523	997,122	619,830	1,194,901	940,790	503,931
Number of observations	6,387	1,597	1,597	1,597	1,596	1,597	1,600	1,594	1,596

[a]Investment category 1 refers to lowest investment and category 4 refers to highest investment.

[b]ROE category 1 refers to lowest quartile of ROE and category 4 refers to highest quartile of ROE.

Table 4. Mean Values for Variables According to Lender Perspective

		ROE Categories[a]				Debt to Farm Operating Income Ratio Categories[b]			
Variables	All	ROE1	ROE2	ROE3	ROE4	DFOI 1	DFOI 2	DFOI 3	DFOI 4
Debt to farm operating income ratio	10.60	26.03	6.90	4.68	4.80	30.55	6.97	3.69	1.34
Interest expense ratio	0.07	0.08	0.06	0.06	0.06	0.11	0.08	0.05	0.02
Asset turnover ratio	0.37	0.36	0.23	0.31	0.56	0.32	0.36	0.40	0.39
Working capital ratio	0.44	0.40	0.65	0.47	0.23	0.12	0.24	0.41	0.98
Net worth	815,031	619,830	1,194,901	940,790	503,931	772,498	733,839	768,435	983,552
ROE	0.10	-0.11	0.03	0.09	0.42	-0.01	0.10	0.18	0.15
Family expenditure ratio	1.55	3.49	1.13	0.78	0.81	3.36	1.21	0.90	0.75
Non-farm income ratio	0.17	0.29	0.18	0.13	0.10	0.26	0.17	0.14	0.12
Debt to asset ratio	0.33	0.37	0.24	0.29	0.44	0.45	0.40	0.33	0.15
Age	49	50	53	49	44	49	49	48	50
Number of observations	6,387	1,597	1,600	1,594	1,596	1,596	1,540	1,650	1,601

[a]ROE category 1 refers to lowest ROE and category 4 refers to highest ROE.

[b]Debt to Farm Operating Income Ratio category 1 refers to highest quartile of debt and category 4 refers to lowest quartile of debt.

Table 5. Regressions According to Borrower Perspective

		Investment Categories[a]				ROE Categories[b]			
Variables	All	Inv1	Inv2	Inv3	Inv4	ROE1	ROE2	ROE3	ROE4
Intercept	-0.386	-0.614	-0.254	-0.333	-0.157	0.483	-0.006	0.018	-1.806
	(-6.62)**	(-4.17)**	(-2.35)**	(-3.69)**	(-1.19)	(5.65)**	(-1.94)*	(2.98)**	(-8.52)**
Machinery Investment ratio	0.0003	0.005	-0.001	0.000	0.000	0.000	0.000	0.000	0.000
	(1.95)*	(1.23)	(-0.58)	(0.65)	(-0.31)	(0)	(2.61)**	(1.76)*	(0.85)
Current ratio	0.000	-0.001	0.000	0.001	0.000	-0.002	0.000	0.000	0.003
	(0.38)	(-0.37)	(-0.15)	(0.7)	(-0.19)	(-1.32)	(-0.52)	(-1.34)	(0.77)
Debt to asset ratio	0.550	0.791	0.314	0.515	-0.102	-0.944	0.057	0.075	2.123
	(9.79)**	(6.05)**	(2.86)**	(5.3)**	(-0.49)	(-12.71)**	(11.39)**	(6.45)**	(7.51)**
Debt to asset ratio squared	-0.324	-0.525	-0.242	-0.255	0.651	0.305	-0.036	-0.033	-0.390
	(-8.38)**	(-7.08)**	(-3.12)**	(-3.25)**	(2.8)**	(7.83)**	(-7.06)**	(-2.13)**	(-1.65)*
Asset turnover ratio	0.275	0.495	0.144	0.238	0.214	-0.257	0.006	0.022	0.808
	(10.39)**	(7.04)**	(3.09)**	(6.3)**	(4.13)**	(-6.31)**	(3.01)**	(7.36)**	(11.67)**
Farm operating income to gross farm return ratio	0.873	0.998	0.658	0.784	0.880	-1.689	0.091	0.173	2.450
	(15.12)**	(6.52)**	(6.05)**	(9.32)**	(7.31)**	(-11.83)**	(19.73)**	(20.59)**	(11.07)**
Cash lease ratio	0.041	-0.008	0.061	-0.007	0.104	-0.027	0.004	0.004	0.100
	(2.26)**	(-0.17)	(1.77)*	(-0.29)	(3.14)**	(-0.99)	(4.7)**	(2.67)**	(1.68)*
Tenure ratio	-0.026	-0.013	-0.051	-0.042	-0.010	0.060	-0.006	-0.043	-0.422
	(-0.8)	(-0.17)	(-0.91)	(-0.88)	(-0.15)	(1.3)	(-4.77)**	(-13.64)**	(-2.94)**
Family expenditure ratio	0.000	0.002	-0.004	0.001	0.008	-0.012	-0.002	-0.004	0.040
	(0.17)	(0.17)	(-0.95)	(0.22)	(1.42)	(-4.7)**	(-4.24)**	(-4.3)**	(1.75)*
Soil productivity	0.000	0.000	0.001	0.000	-0.001	0.000	0.000	0.000	-0.001
	(-0.09)	(0.19)	(0.75)	(-0.34)	(-1.04)	(0.5)	(0.94)	(-0.5)	(-0.3)
Non-farm income ratio	-0.010	0.024	-0.027	0.010	-0.062	0.009	-0.001	0.000	0.225
	(-0.4)	(0.33)	(-0.61)	(0.31)	(-1.27)	(0.32)	(-1.03)	(0.04)	(2.05)**
Acres	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(1.26)	(1.03)	(1)	(1.01)	(0.12)	(3.46)**	(7.98)**	(8.24)**	(-1.79)*
Debt-to-Farm Operating Ratio	0.000	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.009
	(0.41)	(-0.44)	(-0.65)	(-0.84)	(1.14)	(-0.36)	(-5.91)**	(0.57)	(3.24)**
Net worth	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(1.6)	(1.6)	(0.36)	(1.25)	(0.18)	(-4.58)**	(0.84)	(-2.73)**	(3.88)**
Number of observations	6,387	1,597	1,597	1,597	1,596	1,597	1,600	1,594	1,596
Adj R-Sq	8.74%	10.07%	5.59%	12.37%	9.13%	24.83%	32.23%	31.04%	22.12%

Note: T-statistics are in parentheses and *, ** denote significance 10%, and 5%, respectively.

[a]ROE category 1 refers to lowest ROE and category 4 refers to highest ROE.

[b]Investment category 1 refers to lowest investment and category 4 refers to highest investment.

Table 6. Regressions According to Lender Perspective

		ROE Categories[a]				Debt to Farm Operating Income Ratio Categories[b]			
Variables	All	ROE1	ROE2	ROE3	ROE4	DFOI 1	DFOI 2	DFOI 3	DFOI 4
Intercept	-11.158	-18.863	-1.651	-3.269	-7.746	-19.731	5.286	2.983	1.099
	(-6.58)**	(-3.14)**	(-2.52)**	(-6.7)**	(-6.76)**	(-2.54)**	(19.95)**	(23.14)**	(14.71)**
Interest expense ratio	78.257	99.264	35.943	14.195	46.579	66.576	7.791	4.440	10.640
	(11.6)**	(4.68)**	(15.86)**	(8.02)**	(8.64)**	(3.35)**	(7.72)**	(6.76)**	(14.33)**
Asset turnover ratio	-1.801	-9.729	-2.515	-1.068	0.662	-4.545	-0.578	-0.666	-0.788
	(-1.5)	(-2.3)**	(-4.17)**	(-3.27)**	(1.12)	(-0.79)	(-3.05)**	(-8.96)**	(-13.54)**
Working capital ratio	-1.413	-3.329	-0.261	0.203	0.487	-6.061	-0.219	-0.109	-0.088
	(-3.53)**	(-3.15)**	(-2.14)**	(1.57)	(0.85)	(-2.54)**	(-2.58)**	(-3.46)**	(-6.26)**
Net worth	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(8.85)**	(7.21)**	(15.97)**	(13.23)**	(6.43)**	(4.99)**	(2.45)**	(2.68)**	(2.41)**
ROE	-0.389	4.089	-68.438	-13.311	0.317	1.141	-0.206	-0.062	-0.022
	(-0.69)	(1.55)	(-10.25)**	(-5.16)**	(1.49)	(0.36)	(-2.94)**	(-2.3)**	(-0.55)
Family expenditure ratio	5.709	5.415	1.454	2.524	5.877	5.875	0.295	0.195	0.125
	(55.16)**	(24.35)**	(13.16)**	(26.7)**	(44.32)**	(26.22)**	(8.69)**	(7.95)**	(6.02)**
Non-farm income ratio	-1.696	-4.526	-0.011	0.042	-0.910	-1.587	0.078	0.300	0.168
	(-1.48)	(-1.41)	(-0.03)	(0.12)	(-0.96)	(-0.47)	(0.49)	(3.18)**	(2.1)**
Debt to asset ratio	13.848	39.744	20.850	15.809	5.238	27.844	1.274	1.613	2.474
	(7.16)**	(6.09)**	(24.99)**	(28.04)**	(4.35)**	(3.63)**	(4.5)**	(10.14)**	(19.17)**
Age	0.032	0.007	0.004	0.014	0.021	0.136	0.007	-0.001	-0.002
	(1.14)	(0.07)	(0.43)	(2.2)**	(1.16)	(1.23)	(1.88)*	(-0.32)	(-1.82)*
Number of observations	6,387	1,597	1,600	1,594	1,596	1,596	1,540	1,650	1,601
Adj R-Sq	40.41%	35.43%	72.45%	72.28%	65.17%	31.29%	10.62%	15.84%	45.23%

Note: T-statistics are in parentheses and *, ** denote significance 10%, and 5%, respectively.

[a]ROE category 1 refers to lowest ROE and category 4 refers to highest ROE.

[b]Debt-to-farm operating income category 1 refers to highest debt and category 4 refers to lowest debt.