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Characteristics That Make a Farm Consistently Profitable

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Characteristics That Make a Farm Consistently Profitable

Every year some farmers are more profitable than others. On a year-to-year basis, weather is a big factor determining where a farm ranks in profitability compared to a panel of similar farms. Still, an examination of a panel data set from 15 years of Kansas farm management data shows that despite the variability that weather causes, some farms are consistently more profitable than other farms. The analysis indicates that 30 percent or more of farm profitability can be attributed to "management." Management can be difficult to describe but we can identify factors of the operation that might be associated with management. Some of these factors might include operator age, farm size, the amount of assets used, the amount of fertilizer used, and the amount of machinery used. This paper examines farm characteristics to determine the factors that affect the consistency of farm profitability in order to help provide guidance to farmers. If those factors can be identified that lead to a farm either being consistently above or below average, then we can make recommendations to farms that should improve their profitability.

The study for this paper uses a 10 year panel dataset of 600 plus Kansas farms for the years 2003 through 2012 to estimate the contributing factors to profitability. Complete whole farm financial data is available for these farms as well as the location of the farm and the type classification of the farm (i.e., livestock vs. crop). In addition, there is some non-financial data about the farms available. A regression analysis will be conducted to estimate the most important factors determining ROE (Return on Assets). ROE is used as the measure of profitability since it is a ratio and not a dollar amount. Thus farms of different sizes can be combined into the same analysis.

Previous Work

An earlier analysis of farm profitability for the state of Kansas ranked each farm into 10 groups or deciles for each year of the analysis. The top 10 percent of net income farms were assigned a value of "1", the next group of farms based on net farm income were assigned a value of "2" etc. Thus all the farms in a given year had a ranking from 1 to 10 and given each group was the same size, this procedure resulted in a uniform distribution of farm rankings in a given year.

Figure 1 shows the average net farm income by a particular decile for each year. Notice that the bottom 10% of farms lost money each year while the next lowest decile of farms basically broke even, The top 10% of farms earned very high levels of net farm income. The group of farms making up each decile varied each year although there was some consistency among the deciles.

Figure 2 shows the distribution of farm rankings when the yearly decile rankings of a farm are averaged together. The more uniform the histogram, the more likely management was a contributing factor. If the histogram had just been a single average ranking of 5.5, then luck or weather would have been the only factor affecting farm profitability. Since the purple distribution is between a uniform and a single point, we can conclude there must be some management affect on farm profitability.

Data

Data for this analysis is based on a panel data set of Kansas farms for the last 10 years. As a measure of profitability the ROE ratio is used. This makes it possible to compare farms of

different types and also to see if size is a factor affecting profitability. Also examined as independent variables are the farm type, the age of the operator, the debt level, the amount of fertilizer used, the amount of machinery used, and the total capital used. The debt level variable is the debt-to-asset ratio. The amount of fertilizer and machinery are both ratios of the gross crop revenue. For these two ratios, the cost of fertilizer and machinery, respectively are both divided by the gross crop revenue.

For the analysis conducted in this paper, only an exploratory analysis is attempted. Future work will examine this in a regression framework. The visual analysis has two categorical variables that will be used to help subdivide the data. Farm type is the major category divider. Farms here are either crop farms or other farms. Other farms have some level of livestock where it no longer makes sense to define it as a crop farm. When farms are examined as either crop or livestock farms, then all the years are included together. For other parts of the analysis, only the crop farms are used. In these cases, the other categorical variable, years is used as a breakout variable. Some of the dependent variable, ROE, had values outside of a typical range of values. These outliers were not used in the analysis. Farms with an ROE less than -0.2 or above 0.4 were not included.

Results

Figure 3 shows how the debt to asset ratio affects ROE. This graph is similar for both livestock and crop farms. However, the relationship between D/A and ROE is somewhat unique. Farms with the lowest levels of debt earned basically zero ROE. The lowest level of debt was

just under 20% debt to assets. Adding debt beyond this could either improve profitability or make it worse.

Age was the other variable that was examined for both crop and other farms. Like the debt to asset ratio, this variable also had a unique shape and both crop and other farms were similar. Here, the oldest farmers, around 60 to 65 years of age, earned zero ROE. As the farm age was lowered, ROE either went up or it went down.

The rest of the analysis only examined crop farms. Figure 5 compares machinery cost as a percentage of gross crop revenue to ROE. In the rest of these figures, each year is shown separately. As machinery use is increased, ROE decreases. Most of the years are consistent except for one year than is more pronounced.

Figure 6 compares fertilizer cost as a percentage of gross crop revenue to ROE. Like machinery cost, as more fertilizer is used, ROE decreases. Figure 7 examines total capital (which includes the value of rented land) to see how it affects ROE. Here, ROE increases as capital is increased. Figure 9 is similar but only the crop acre part of total capital is examined. Again more acres increases ROE. Figure 9 is not a pure linear regression but is a smoothed plot that allows a better fit to the data. As Figure 9 indicates, the crop acre effect peaks between 2,000 and 2,500 acres.

Conclusions

Management is a factor that can affect yearly profitability. We were able to examine several characteristics that might be associated with good management. Debt seems to improve profitability but it can also lower profitability. Thus, higher levels of debt capital could be

associated with both good and poor farm managers. Age is another factor affecting ROE. The oldest farmers would break even while younger farmers would earn either lower or higher rates of return. The dichotomy becomes greater with younger age.

The use of more fertilizer and more machinery as a percentage of gross crop revenue tended to lower profitability. The machinery part is probably not unexpected but the use of fertilizer might be a surprise. If adding more fertilizer was beneficial, then net revenues would increase while equity stayed the same. Since the graph doesn't show this relationship, it might indicate that farmers are already near the profit maximizing level of fertilizer.

The last two graphs would indicate there are definitely some size advantages to farms. Smaller farmers will have a more difficult time competing as a result. The crop acre figure would indicate though the size advantage starts to level out and may even start to decrease at a point. Here, it appears a farm size of 2,000 to 2,500 acres may be ideal.

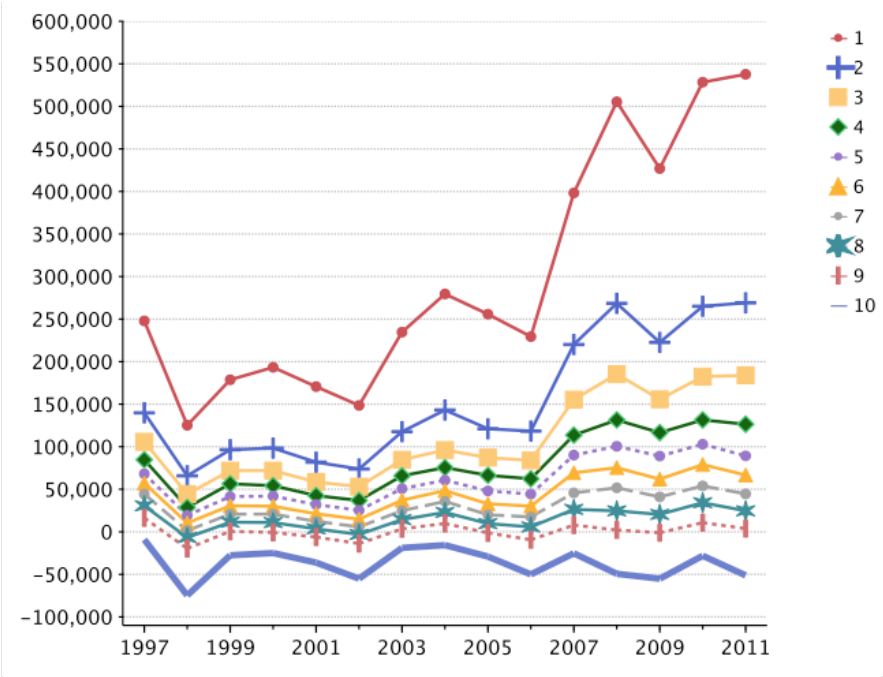

Figure 1. Average net farm income by decile per year

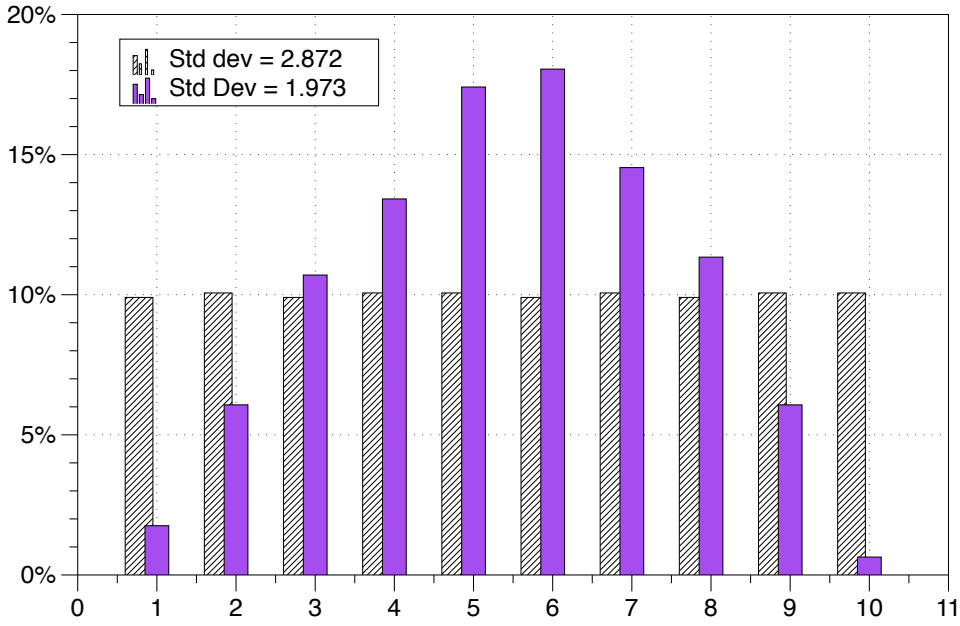

Figure 2. Distribution of average farm rankings

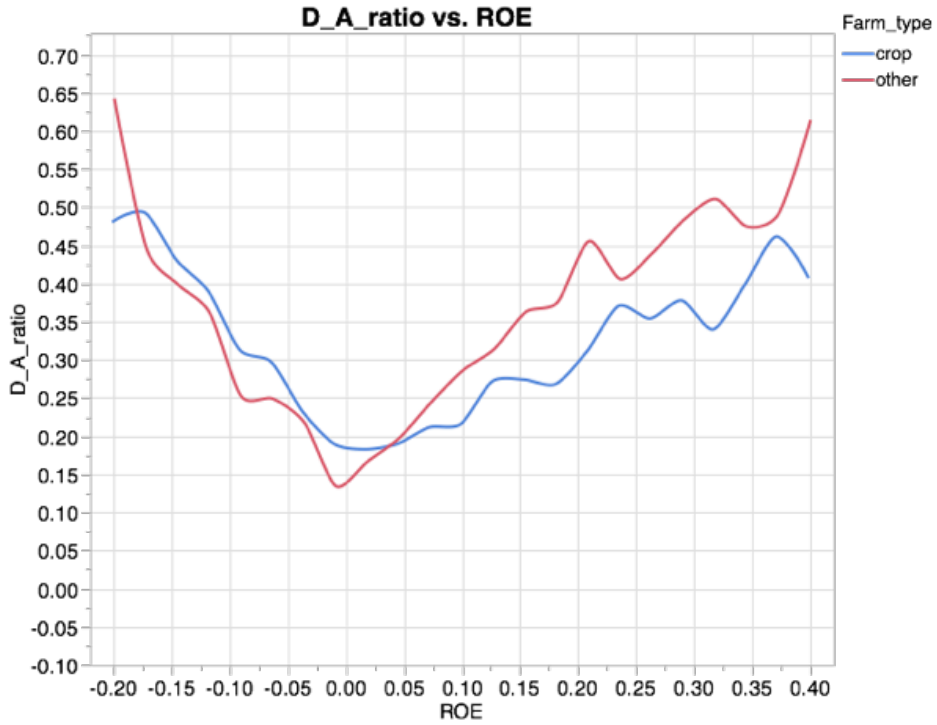

Figure 3. Debt to Asset Ratio as a Predictor of ROE

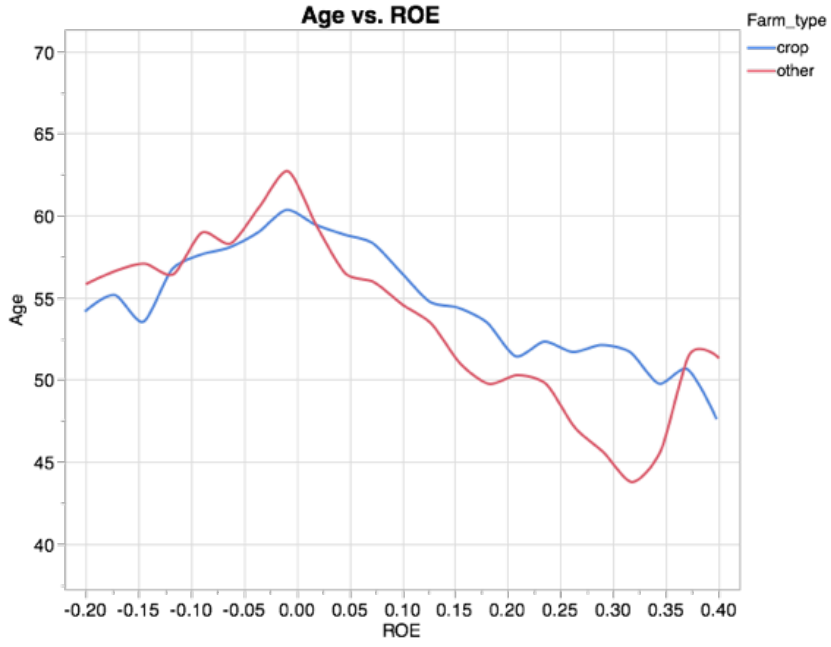

Figure 4. Operator Age as a Predictor of ROE

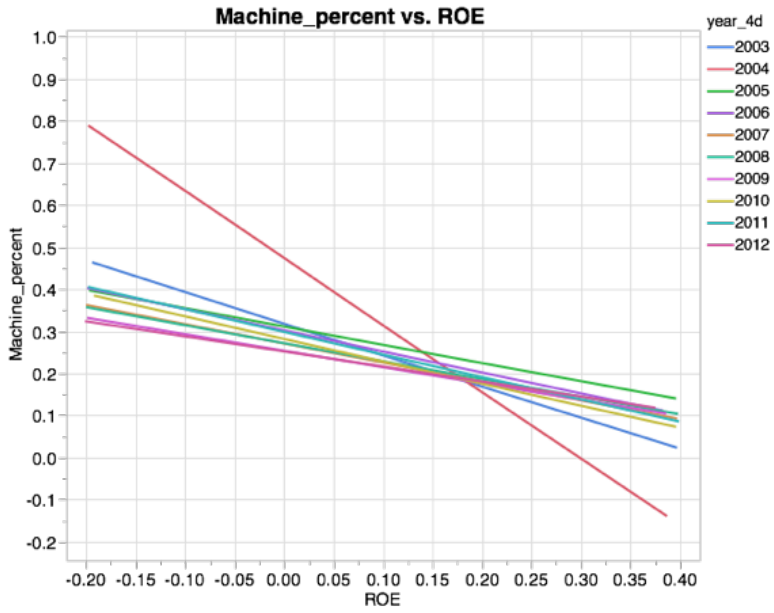

Figure 5. Machine Cost Percentage as a Predictor of ROE

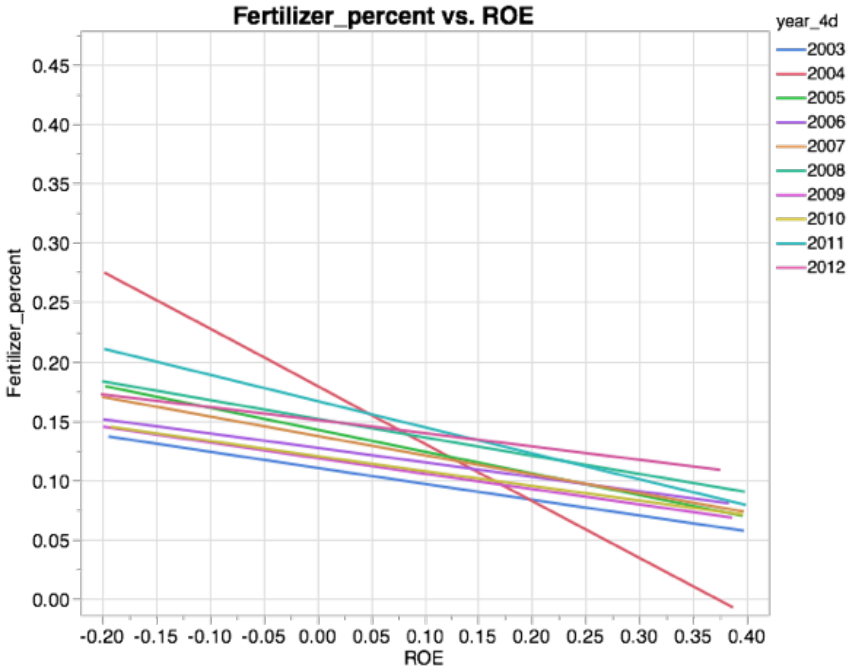

Figure 6. Fertilizer Cost Percentage as a Predictor of ROE

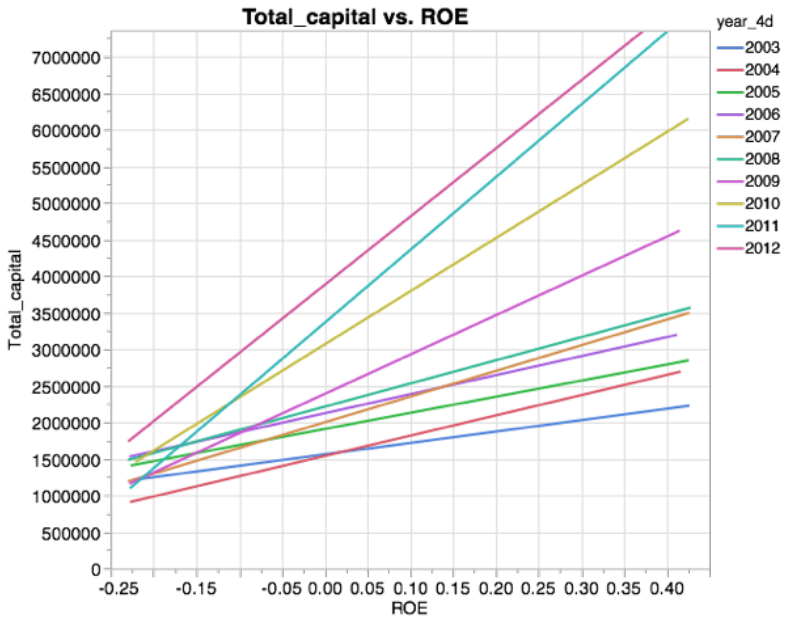

Figure 7. Total Capital as a Predictor of ROE

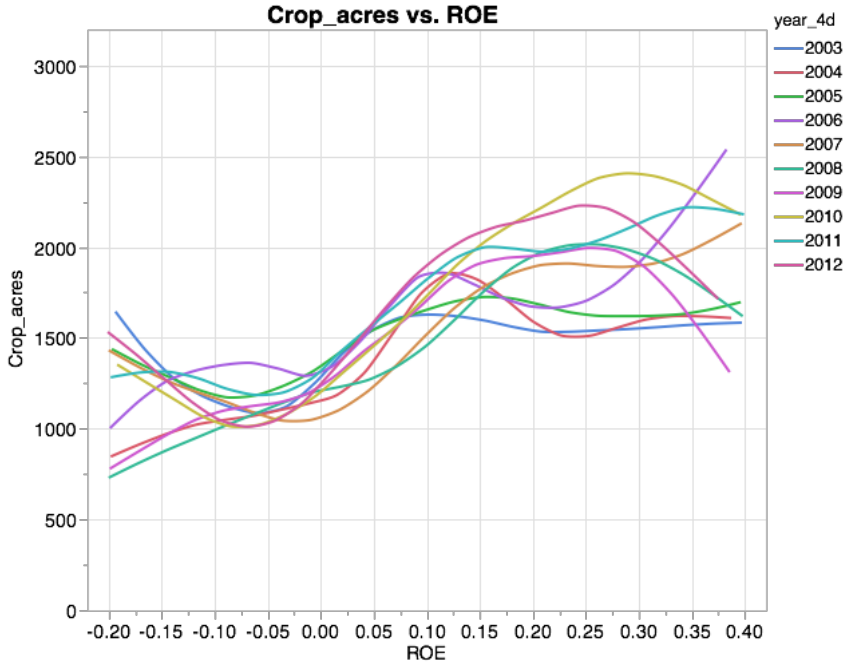

Figure 8. Crop Acres as a Predictor of ROE