Benchmarking Recommendations Using a Sample of Kansas Farms

Abstract

The purpose of this paper was to develop recommendations for benchmarking. The operating profit margin ratio and the asset turnover ratio were the chosen benchmarks. These ratios were computed for each farm in the data set using one-year average data through five-year average data. Farms were examined at the state level, regional level, and by using the percent of labor devoted to crop and livestock production. Results suggest that five years worth of data should be used to benchmark and that farms should be compared to those that are similar in terms of whether they devote more labor to crop or livestock production. It is also recommended that evaluations are made by categorizing farms into quartiles based on the financial ratio used to benchmark.

Major Theme: Farm Management

Keywords: Benchmarking, Profit Margin, Asset Turnover

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Introduction

In production agriculture, there is heterogeneity in terms of the inputs and outputs produced by farms. Benchmarking can aid farms in becoming more competitive by helping them to identify the strengths of other farms that they can imitate and find ways in which they can surpass the competition (Barney & Clark 2007).

Internal and external benchmarking can be utilized. Internal benchmarking allows a farm to learn from itself and identify things from the past that have worked and what should be changed to increase efficiency. External benchmarking is where a farm compares their financial ratios or whatever they are benchmarking with similar farms (Reider 2000).

The task of benchmarking can seem daunting if an individual does not know where to begin. There are many items that can be benchmarked and often it is difficult to find a consistent definition of common benchmarking ratios. Therefore, it is important to make sure you have accurately defined your measures. Most farms can probably identify areas that they would like to improve on and by benchmarking farms can determine how they stand next to the competition (Boxwell 1994).

The purpose of this study was to provide a recommendation in terms of the number of years worth of data necessary to benchmark and to determine if there are benefits to benchmarking using data from similar farms based on the amount of labor devoted to crop production. A study by Langemeier (2007) found similar results in the sense that using only one or two years of data to benchmark is problematic.

Methods and Data

Two common benchmarking measures were used in this analysis: the operating profit margin ratio (OPMR) and the asset turnover ratio (ATR). Multiplying these two ratios together results in the return on assets. Thus, return on assets can be improved by increasing either ratio. The OPMR measures the relative profitability of a business while the ATR measures the effectiveness of asset utilization by a business. The OPMR is defined as follows:

(1) OPMR = (net farm income + interest expense – unpaid operator and family labor) ÷
(value of farm production)

Unpaid operator and family labor was computed by multiplying the number of operators by the average family living expense. Part-time farmers or semi-retired farmers are designated as a fraction of an operator for computation purposes. For example, a part-time farmer that devotes 50 percent of his time to the farm operation, was designated as having 0.50 operators. The ATR is defined as follows:

(2) ATR = (value of farm production) / (average total farm assets)

Total farm assets were computed using the market valuation approach. It is important to note that gross

revenue could also be used instead of value of farm production to define these ratios (Farm Financial Standards Council 2008).

The financial ratios were calculated for each farm in the data set using one-year average data, two-year average data, three-year average data, four-year average data, and five-year average data. In order to determine the general level at which benchmarking can best be implemented the farms were examined at the state level, regional level (east, central, and west), and by using the percent of labor devoted to crop and livestock production. Farm enterprise mix changed over time. Thus, it was often difficult to classify a farm as a crop or livestock farm when using data from multiple years. When there was a dispute between comparisons of data from multiple years (e.g., two-year average compared to three-year average), the average that was based on the most years was used. For example, if a farm was primarily a livestock operation using the two-year average and primarily a crop operation using the three-year average, the farm was considered to be a crop farm for the comparison.

The overall goal of this study was to determine a standard of how many years of data should be used for benchmarking assuming that at some point there is stabilization of the financial ratio in question. If a financial ratio has stabilized, additional years of data are not needed to create the benchmark. In order to determine whether the ratios were becoming more stable, t-tests were performed in EXCEL to compare the respective ratio for one set of years to the ratio of the same years plus an additional year. Specifically, if the p-value of the t-test was above 0.05 for a specific comparison among averages (e.g., two-year average compared to three-year average), the financial ratio was assumed to be becoming more stable. Conversely, if a p-value of the t-test was below 0.05, the average financial ratios were significantly different and therefore the ratios were not becoming more stable. The average differences between the ratios were also calculated. Within each group of farms, the farms were separated into quartiles using their OPMR and ATR for each average period. In the case of a dispute in the placement into quartiles between years, the categorization from the average with the most years was used. T-tests were calculated for the total sample of farms, top and bottom deciles, top and bottom quartiles, and top and bottom thirds.

The farms chosen for this study participated in the Kansas Farm Management Association (KFMA) program (Kansas Farm Management Association 2008). The 801 farms included in this study all had continuous data from 2003 to 2007. The variables used to compute the financial ratios included accrual net farm income, interest expense, unpaid operator and family labor, value of farm production, and average total farm assets. The data for 2007 was used for the one-year average, 2006-2007 was used for the two-year average, and the pattern continues until 2003-2007 was used for the five-year average.

The average net farm income in 2007 was $119,976, the two-year average was $88,957, the three-year average was $80,471, the four-year average was $80,804, and the five-year average was $77,196. The minimum five-year average net farm income was -$72,652 and the maximum five-year average net farm income was $969,296. The average interest expense in 2007 was $22,468, the two-year average was $21,078, the three-year average was $19,721, the four-year average was $18,582, and the five-year average was $18,140. The average unpaid operator and family labor in 2007 was $52,388, the two-year average was $50,617, the three-year average was $49,991, the four-year average was $48,730, and the five-year average was $47,381. The average value of farm production in 2007 was $424,200, the two-year average was $377,083, the three-year average was $358,820, the four-year average was $346,595, and the five-year average was $332,938. The minimum five-year average value of farm production was $31,147 and the maximum five-year average value of farm production was $3,064,552. The average total farm assets in 2007 was $1,343,619, the two-year average was $1,265,146, the three-year average was $1,204,591, the four-year average was $1,142,336, and the five-year average was $1,088,970.

The weighted average OPMR for all farms in 2007 was 0.212, the two-year average was 0.158, the three-year average was 0.140, the four-year average was 0.146, and the five-year average was 0.144. The weighted average ATR for all farms in 2007 was 0.316, the two-year average was 0.298, the three-year average was 0.298, the four-year average was 0.303, and the five-year average was 0.306.

Results

Table 1 presents the results for the entire sample of 801 farms. There were 2 comparisons that were not significantly different for OPMR and 3 for ATR. Table 2 represents an average of 726 predominantly crop farms based on the percentage of labor devoted to crop production. In this case, 4 comparisons were not significantly different for OPMR and 4 for ATR. Table 3 represents an average of 342 predominantly crop farms in the eastern regions of Kansas. There were 7 comparisons that were not significantly different for OPMR and 3 comparisons that were not significantly different for ATR. Table 4 represents an average of 300 predominantly crop farms in the central region of Kansas. In this region, 6 comparisons for OPMR were not significantly different from each other and 6 of the ATR comparisons were not significantly different. Table 5 represents an average of 84 predominantly crop farms in the western regions of Kansas. Four of the OPMR comparisons showed no significant difference and 3 of the ATR comparisons showed no significant difference for this region. Table 6 represents an average of 75 predominantly livestock farms. For these farms, 6 of the OPMR comparisons showed no significant difference between them and 3 of the ATR showed no significant difference.

Table 1. P-values and average differences for all farm types and regions

	OPMR		ATR	
	p-values	differences	p-values	differences
All Farms				
1 year to 2 year average	0.0000	0.0240	0.0000	0.0202
2 year average to 3 year average	0.0001	0.0114	0.0277	0.0028
3 year average to 4 year average	0.0000	-0.0110	0.0003	-0.0038
4 year average to 5 year average	0.5164	-0.0010	0.0250	-0.0018
Top Quartile				
1 year to 2 year average	0.0000	0.0558	0.0000	0.0482
2 year average to 3 year average	0.0000	0.0178	0.0014	0.0149
3 year average to 4 year average	0.0991	-0.0042	0.8640	-0.0006
4 year average to 5 year average	0.0080	0.0047	0.9443	-0.0002
Bottom Quartile				
1 year to 2 year average	0.0000	-0.0481	0.3433	0.0015
2 year average to 3 year average	0.0000	-0.0086	0.0000	-0.0036
3 year average to 4 year average	0.0000	-0.0251	0.0000	-0.0058
4 year average to 5 year average	0.0000	-0.0058	0.0000	-0.0033

Table 2. P-values and average differences for predominately crop farms based on OPMR and ATR

	OPMR		ATR	
	p-values	differences	p-values	differences
All Farms				
1 year to 2 year average	0.0000	0.0279	0.0000	0.0215
2 year average to 3 year average	0.0000	0.0178	0.0005	0.0049
3 year average to 4 year average	0.0000	-0.0090	0.0140	-0.0028
4 year average to 5 year average	0.4520	-0.0013	0.0523	-0.0017
Top Quartile				
1 year to 2 year average	0.0000	0.0564	0.0000	0.0485
2 year average to 3 year average	0.0000	0.0231	0.0005	0.0177
3 year average to 4 year average	0.5790	-0.0014	0.9046	0.0005
4 year average to 5 year average	0.0048	0.0052	0.9052	-0.0004
Bottom Quartile				
1 year to 2 year average	0.0449	-0.0415	0.1504	0.0025
2 year average to 3 year average	0.8799	0.0015	0.0058	-0.0023
3 year average to 4 year average	0.0018	-0.0207	0.0000	-0.0051
4 year average to 5 year average	0.3675	-0.0051	0.0000	-0.0030

Table 3. P-values and average differences for predominately crop farms in eastern Kansas based on OPMR and ATR

	OPMR		ATR	
	p-values	differences	p-values	differences
All Farms				
1 year to 2 year average	0.0002	0.0364	0.0000	0.0190
2 year average to 3 year average	0.2737	0.0053	0.8269	-0.0003
3 year average to 4 year average	0.0000	-0.0143	0.0000	-0.0086
4 year average to 5 year average	0.8802	0.0004	0.0000	-0.0036
Top Quartile				
1 year to 2 year average	0.0000	0.0575	0.0000	0.0382
2 year average to 3 year average	0.0000	0.0203	0.0700	0.0066
3 year average to 4 year average	0.0860	-0.0072	0.0000	-0.0137
4 year average to 5 year average	0.1730	0.0041	0.0071	-0.0068
Bottom Quartile				
1 year to 2 year average	0.3099	-0.0347	0.1034	0.0040
2 year average to 3 year average	0.2584	-0.0191	0.0008	-0.0042
3 year average to 4 year average	0.0106	-0.0243	0.0000	-0.0080
4 year average to 5 year average	0.8033	-0.0019	0.0001	-0.0033

Table 4. P-values and average differences for predominately crop farms in central Kansas based on OPMR and ATR

	OPMR		ATR	
	p-values	differences	p-values	differences
All Farms				
1 year to 2 year average	0.5227	0.0059	0.0008	0.0110
2 year average to 3 year average	0.0000	0.0285	0.0016	0.0091
3 year average to 4 year average	0.0084	-0.0089	0.4039	-0.0018
4 year average to 5 year average	0.1600	-0.0041	0.2788	-0.0018
Top Quartile				
1 year to 2 year average	0.0000	0.0504	0.0275	0.0246
2 year average to 3 year average	0.0000	0.0274	0.0113	0.0281
3 year average to 4 year average	0.6408	0.0014	0.9967	0.0000
4 year average to 5 year average	0.0976	0.0030	0.7631	-0.0018
Bottom Quartile				
1 year to 2 year average	0.0308	-0.0662	0.3271	-0.0025
2 year average to 3 year average	0.2113	0.0162	0.8652	-0.0002
3 year average to 4 year average	0.0136	-0.0270	0.0473	-0.0029
4 year average to 5 year average	0.1835	-0.0132	0.0053	-0.0027

Table 5. P-values and average differences for predominately crop farms in western Kansas based on OPMR and ATR

	OPMR		ATR	
	p-values	differences	p-values	differences
All Farms				
1 year to 2 year average	0.0000	0.0715	0.0000	0.0688
2 year average to 3 year average	0.0000	0.0299	0.0043	0.0103
3 year average to 4 year average	0.0177	0.0125	0.0001	0.0168
4 year average to 5 year average	0.6512	0.0020	0.0487	0.0067
Top Quartile				
1 year to 2 year average	0.0032	0.0669	0.0001	0.1607
2 year average to 3 year average	0.0302	0.0359	0.0683	0.0207
3 year average to 4 year average	0.9854	-0.0002	0.0006	0.0495
4 year average to 5 year average	0.6748	-0.0029	0.0246	0.0261
Bottom Quartile				
1 year to 2 year average	0.0002	0.0706	0.0002	0.0261
2 year average to 3 year average	0.0051	0.0310	0.6790	0.0010
3 year average to 4 year average	0.1029	0.0129	0.0432	0.0054
4 year average to 5 year average	0.0223	0.0095	0.9077	0.0002

Table 6. P-values and average differences for predominately livestock farms in Kansas

	OPMR		ATR	
	p-values	differences	p-values	differences
All Farms				
1 year to 2 year average	0.5740	-0.0113	0.0700	0.0086
2 year average to 3 year average	0.0000	-0.0476	0.0000	-0.0157
3 year average to 4 year average	0.0000	-0.0319	0.0000	-0.0139
4 year average to 5 year average	0.6941	0.0015	0.0247	-0.0028
Top Quartile				
1 year to 2 year average	0.1485	0.0257	0.0011	0.0387
2 year average to 3 year average	0.0170	-0.0319	0.0066	-0.0222
3 year average to 4 year average	0.0005	-0.0351	0.0006	-0.0180
4 year average to 5 year average	0.8289	0.0012	0.7834	0.0009
Bottom Quartile				
1 year to 2 year average	0.1781	-0.0801	0.1331	-0.0058
2 year average to 3 year average	0.0029	-0.0841	0.0000	-0.0123
3 year average to 4 year average	0.0000	-0.0751	0.0000	-0.0091
4 year average to 5 year average	0.3419	-0.0125	0.0065	-0.0048

Based on the results in Tables 1 through 6, it appears that farms stabilize in terms of OPMR more often than in terms of ATR. This was an unexpected result because total farm assets were assumed to remain relatively constant across years. The OPMR for the entire group of farms stabilized when four-year and five-year averages were utilized. Conversely, the ATR did not stabilize. The results were the same when looking at only crop farms which made up the majority of the sample. The ratios stabilized a little more when looking at predominantly crop farms by region. It proved relevant to divide the farms further down by type, but it did not appear like much was gained by focusing on regions. Predominately livestock operations were not broken down into regions because of the limited sample size.

Farm managers are often curious as to what it takes to be categorized in the top level whether it is decile, third, or quartile and especially concerned about what it requires to not fall into the bottom categories. Originally the farms were broken down into deciles, quartiles, and thirds, but there did not seem to be much of an advantage gained by breaking the farms down into deciles or thirds rather than quartiles so those results are not included.

Based on the results of this study it is recommended that producers use 5 years of data to benchmark and that ratios are compared to farms that are similar in terms of whether they devote more labor to crop production or livestock. Also, it is recommended that benchmarks be computed using quartiles. Five years worth of data is recommended because 21 of the comparisons or 58.3 percent of the comparisons we looked at were not significantly different for the 4 to 5 year average ratio comparisons. This was almost twice as many stabilized ratios as any other comparisons.

The following are five-year benchmarks that could be used based on the data set employed in this sample. The weighted average OPMR and ATR of predominantly crop farms in the top quartile are 0.266 and 0.636, respectively. The weighted average OPMR and ATR of predominantly livestock operations in the top quartile are 0.306 and 0.505, respectively. It is evident just from looking at these four ratios that crop and livestock operations should not be grouped together when benchmarking because with their different cost structures accurate comparisons cannot be made. In order to be in the top quartile of crop farms in Kansas a farm should have an OPMR of at least 0.193 and an ATR of at least 0.449 using the five-year average ratios. In order to be in the top quartile of predominantly livestock operations in Kansas, an operator should have an OPMR of at least 0.219 and an ATR of at least 0.389. The cutoffs here were closer than the averages for the top quartiles, but it is still advisable to make comparisons based on the type of operation.

It is not realistic for a farm to be the best in every aspect. Therefore, the weighted average ATR for the farms in the top quartile based on their OPMR was also computed. The average ATR for predominately

crop farms in the top quartile based on OPMR was 0.308. The average ATR for predominately livestock operations in the top quartile based on OPMR was 0.287.

Conclusion

This paper examined benchmarking using two common financial ratios, the operating profit margin ratio and asset turnover ratio. Five years worth of data were examined for 801 Kansas farms during the period 2003-2007. The financial ratios were calculated for each farm in the data set using one-year average data, two-year average data, three-year average data, four-year average data, and five-year average data. T-tests were calculated on sequential averages to determine if and when the ratios stabilized.

Results indicated that it was essential to use five-year averages for benchmarking. It was also important to divide the farms depending on whether they devoted more labor to crop or livestock production. The results also indicated that it was sufficient to benchmark using quartiles as not much was gained by looking at deciles or thirds.

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