Analyzing Determinants of Profitability and Persistence of Profitability in Local Grain Marketing and Farm Supply Cooperatives

Scott Boyd, analyst, NOBLE Foundation, Oklahoma

Michael Boland and David Barton
Professors of Agricultural Economics
Arthur Capper Cooperative Center
Kansas State University

Motivation

- Research shows that some firms are able to repeat their performance over time.
- Research on determinants of profitability find weak causality between profitability and other measures such as ratios, prices, etc.
  - Large unexplained variation in regressions
- Key questions: Can we quantify the impact of management?

Objective

- The objective is to evaluate local farm supply and grain marketing cooperatives, based on return on equity and determine if they are able to achieve persistent profits over time.
- Builds on several master's theses at Kansas State that looked at determinants of profitability in IOFs and co-ops
  - Freberg, Claussen, Mitchell
  - Other research on management and industry effects and family-owned firms.

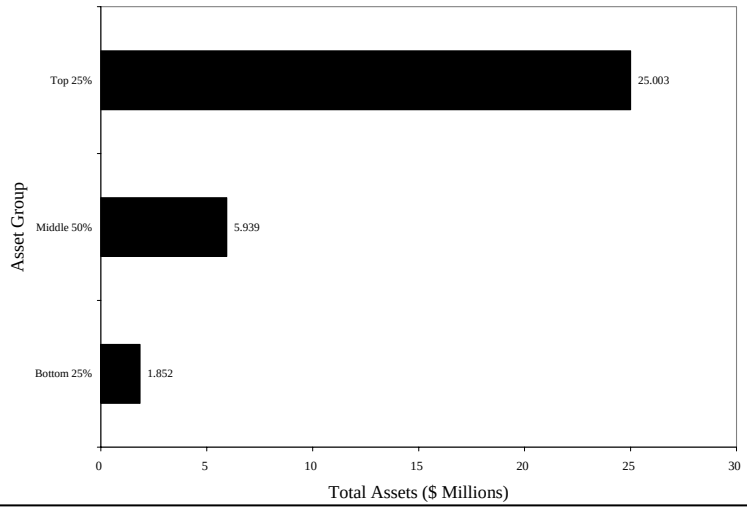
Data

- Income statement and balance sheet data 648 local farm supply and grain marketing cooperatives over 1993 to 2003 time period.
- Data represents 36 states in the US
  - Sales volume is less than $300 million
  - Cross sectional, time series data
  - Carefully screened

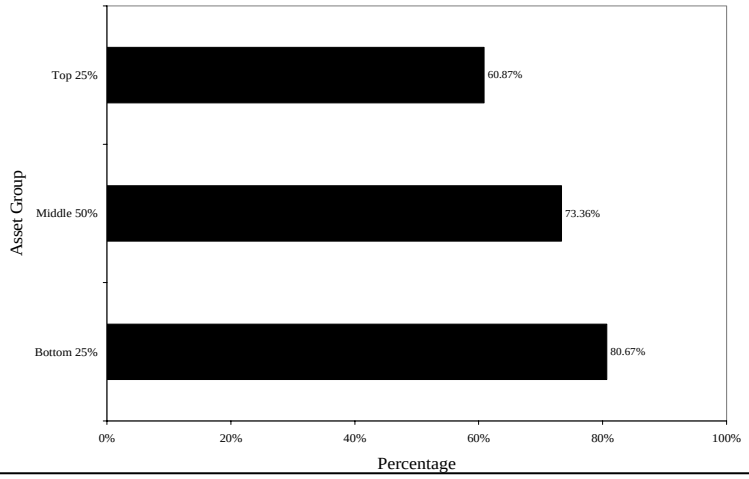
Conceptual Model

- Fundamental concept is that a manager is evaluated on decisions made over a two-year period. Thus, ROE today is due to decisions made two years ago. Variables that we can quantify are linked to liquidity, solvency, profitability, efficiency, and risk.
  - Farm management studies have used measures of management such as farmer's price and yield relative to a county average.

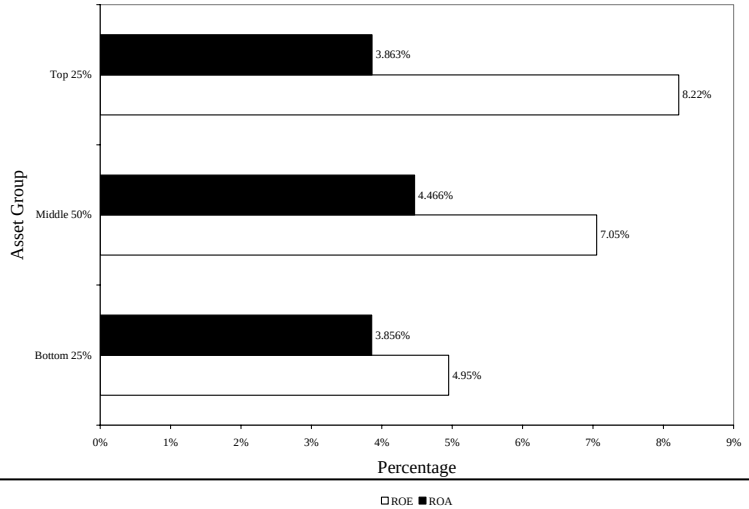
Average Asset Size



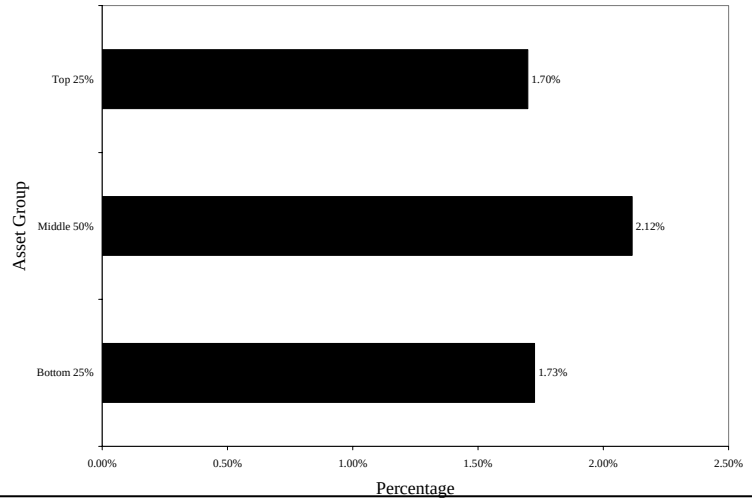
Average Equity-to-Assets



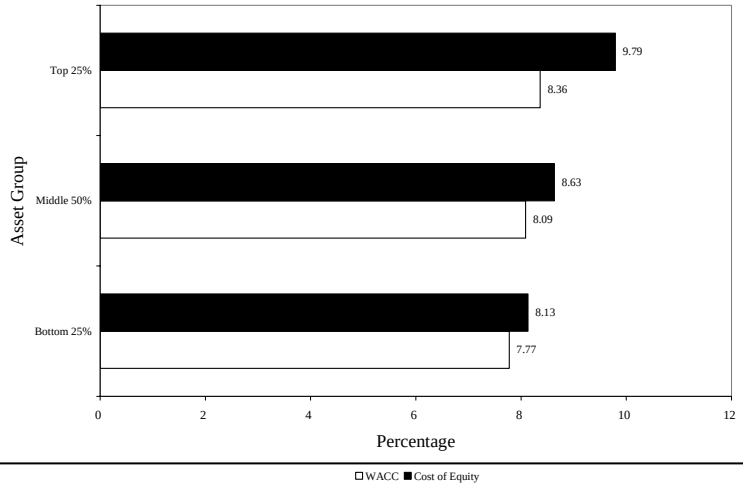
Average ROE and ROA



Average Net Margin (Return on Sales)



Average Weighted Cost of Capital



Persistence of Profitability Ranking for ROE, 1995 to 2003.

	Denotes the Number of Periods (out of 9) that a Cooperative Ranked			
Percent	9	8	7	6
Top 25	15[a]	15	21	27
Middle 50	11	46	63	96
Bottom 25	1	12	9	31

a Denotes that 15 cooperatives were able to rank in the top 25 percent in all nine periods.

Number of Cooperatives Ranking in the Top, Middle, and Bottom Groups Seven or More Times in the Nine Periods, 1995 to 2003

	Number[a] in		
Variable	Top 25 percent	Middle 50 percent	Bottom 25 percent
ROE	51	120	50
Value Created Index	65	129	44

[a]The observed frequency of each number exceeds the expected frequency at the five percent probability level.

Clear sustainability of ROE over time

Number of Cooperatives in the Nine Classes for ROE

Beginning Performance, 1995-1997	Ending Performance, 2001-2003: High (25%)	Medium (50%)	Low (25%)
High (25%)	Sustained High Performers 71 (10.9%)[a]	Declining High Performers 72 (11%)	Fallen High Performers 20 (3.1%)
Medium (50%)	Rising Moderate Performers 76 (11.7%)	Steady Moderate Performers 175 (26.9%)	Declining Moderate Performers 74 (11.4%)
Low (25%)	Turnarounds 16 (2.46%)	Rising Underperformers 78 (12%)	Chronic Underperformers 68 (10.4%)

[a] denotes that 71 cooperatives ranked in the top 25% in 1995 to 1997 and 2001 to 2003. The 10.9% denotes this as a percentage out of 648 cooperatives.

Average Financial Measures

Group	Beginning Performance	Ending Performance	Average ROE, %	Average Size in Assets (mil $)	Median Size in Assets (mil $)	Average Value Created Index,%	Average Net Margin,%	Average Debt Ratio,%	Average WACC,%	Average ROA,%
Sustained High Performers	High	High	14.77%	14.88	6.65	4.10%	4.02%	26.54%	7.78	8.53%
Declining High Performers	High	Medium	10.15%	9.3	5.92	-0.91%	2.94%	25.92%	7.96	6.21%
Fallen High Performers	High	Low	5.77%	9.52	8.42	-5.61%	1.41%	34.81%	8.35	3.70%
Rising Moderate Performers	Medium	High	9.95%	10.33	4.82	-1.22%	2.80%	28.52%	7.95	5.87%
Steady Moderate Performers	Medium	Medium	6.79%	10.06	5.87	-3.64%	1.97%	25.49%	8.00	4.23%
Declining Moderate Performers	Medium	Low	3.30%	7.80	5.27	-5.89%	1.08%	25.82%	8.04	2.43%
Turnarounds	Low	High	9.50%	12.73	9.05	-11.60%	0.28%	48.22%	8.62	1.42%
Rising Underperformer	Low	Medium	3.70%	9.09	5.32	-7.43%	0.89%	28.92%	8.36	2.16%
Chronic Underperformer	Low	Low	1.36%	5.20	3.41	-11.63%	0.09%	31.70%	1.76	0.32%

Summary

- Clearly some co-ops remained ‘good’ co-ops over time
  - Alternatively, some ‘good’ managers remained ‘good managers’ over time.
- And, some co-ops remained ‘mediocre’ co-ops over time.
- Nothing really new here: sustainability of local co-ops are similar to other businesses in other research
- Question: can we predict ‘good management’?

Can we predict good management?

- Theoretical model and regression analysis

Two-year moving average used in lagged variables

- Each variable is measured as the two-year moving average.

$$\overline{ROE}_{i,t} = f(\overline{LIQUIDITY}_{i,t-2}, \overline{SOLVENCY}_{i,t-2}, \overline{PROFITABILITY}_{i,t-2}, \overline{EFFICIENCY}_{i,t-2}, \overline{RISK}_{i,t-2}),$$

$$\overline{ROE}_{i,t} = f(\overline{\text{CurrentRatio}}_{i,t-2}, \overline{\text{Assets-to-EquityRatio}}_{i,t-2}, \overline{\text{ROE}}_{i,t-2}, \overline{\text{NetProfitMargin}}_{i,t-2}, \overline{\text{AssetTurnover}}_{i,t-2}, \overline{\text{TimesInterestEarned}}_{i,t-2}, \overline{\text{Risk}}_{i,t-2}, \overline{\text{Assets}}_{i,t-2}).$$

Risk is measured as standard deviation of lagged ROE.

Data was differenced.

Variables	Mean	Standard Deviation	Minimum	Maximum
Return on Equity	0.00	0.13	-5.38	0.51
Value Created Index	0.00	0.00	-5.23	0.58
Current Ratio	0.00	3.25	-3.52	62.7
Assets-to-Equity	0.00	0.77	-0.99	18.90
Lagged Return on Equity	0.00	0.17	-5.38	6.66
Net Profit Margin	0.00	0.03	-0.43	0.20
Asset Turnover	0.00	1.38	-2.05	31.78
Times Interest Earned	0.00	0.01	-0.39	0.25
Total Assets	0.00	0.12	-0.07	2.22
Risk	0.00	0.14	-0.11	1.71

Regression Results Estimating Lagged Financial Ratios on Future ROE

Variable	Parameter Estimate (Standard Error)
Intercept	0.0635 (0.0090)
Lagged Current Ratio	-0.0004 (0.0002)[a]
Lagged Assets-to-Equity Ratio	-0.0092 (0.0016)[a]
Lagged Return on Equity Ratio	1.4121 (0.0165)[a]
Lagged Net Profit Margin Ratio	0.9088 (0.0635)[a]
Lagged Asset Turnover Ratio	0.0019 (0.0007)[a]
Lagged Times-Interest-Earned Ratio	-0.1154 (0.1907)
Lagged Standard Deviation of Return on Equity	-0.0265 (0.0087)[a]
Lagged Assets	-0.0107 (0.008)

aDenotes that the variable is significantly different from zero at the 0.10 level of significance.

Model results

- The R2 was 0.3526 percent. That is, this model explained 35.26 of the variation in ROE over time.
  - Similar to other studies of farm managers and agribusiness managers
- Not a very good method to predict ROE!
- Clearly, there are omitted variables

Does geography matter?

State Information

State	ROE	Total Number of Cooperatives	Percent from the State	Average ROE 1995 to 2003	Standard Deviation of ROE	Coefficient of Variation
Arkansas	4	18	22.20%	8.15%	11.88%	1.46
California	1	3	33.30%	13.19%	6.82%	0.52
Colorado	0	21	0.00%	4.05%	41.58%	10.27
Delaware	1	1	100.00%	10.54%	5.04%	0.48
Idaho	1	5	20.00%	9.12%	6.25%	0.69
Illinois	6	75	8.00%	6.50%	6.89%	1.06
Indiana	2	24	8.30%	5.76%	5.42%	0.94
Iowa	10	63	15.90%	8.07%	8.25%	1.02
Kansas	1	81	1.20%	4.97%	13.34%	2.68
Kentucky	3	18	16.70%	7.12%	6.53%	0.92
Louisiana	3	8	37.50%	9.43%	41.22%	4.37
Mississippi	2	10	20.00%	14.35%	71.32%	4.97
Minnesota	10	39	25.60%	9.30%	7.49%	0.81
Missouri	1	16	6.30%	6.49%	8.58%	1.32
Montana	1	2	50.00%	13.45%	7.05%	0.52
Nebraska	1	35	2.90%	7.04%	8.60%	1.22
North Dakota	3	24	12.50%	8.19%	7.25%	0.89
Ohio	2	26	7.70%	6.62%	7.61%	1.15
Oklahoma	0	25	0.00%	1.55%	22.34%	14.40
South Dakota	1	10	10.00%	9.26%	5.20%	0.56
Tennessee	7	50	14.00%	7.17%	6.77%	0.94
Texas	2	13	15.40%	7.94%	14.83%	1.87
Virginia	5	28	17.90%	6.54%	7.37%	1.13
Washington	1	15	6.70%	9.72%	7.92%	0.82
West Virginia	0	5	0.00%	3.12%	5.93%	1.90
Wisconsin	3	15	20.00%	7.64%	6.79%	0.89

You bet. Geography helps

- Yes! Illinois, Iowa, Minnesota, and Wisconsin have greater ability to sustain performance over time and lower variability in ROE over time.
  - Less weather risk?
  - Higher valued program crops?
  - Non-farm business
- Great Plains states have lower ROE but greater variability in ROE over time.
  - Greater weather risk
  - Variable yields

Summary and Conclusions

- The study did show statistical evidence that some cooperatives were able to achieve persistent performance during the time period 1995 to 2003.
  - No correlation between asset size or sales volume and sustainability
- Similar results were found using Value Created as dependent variable.
  - Over half the co-ops that had sustained performance on ROE also had it on VC.

Limitations

- Measurement error
- Survivor bias
- Short-time period
  - It is possible to go from bottom to top over time
    - Boland and Schumacher (AFR)
- Need for geographic variable
  - Zip code
  - Measure bushels produced and acres planted

How do we study management if we cannot measure it?

- Sustainability exists
  - Some co-ops, agribusinesses, etc. remain well managed co-ops
  - Industry helps explain some of variation
  - Governance (family-controlled vs. non-family controlled)
  - But there is still unexplained variation
    - Management is what is missing
- Case studies is how colleges of businesses study management
  - We need more for local co-ops
- Can we improve on that?
  - Theory (i.e., organizational economics)

Questions

- 2006 Arthur Capper Cooperative Center Symposium on Cooperative Issues will discuss characteristics of high performing co-ops with three history patterns.
  - Great to great
  - Good to great
  - Bad to great