20. Factors Influencing Farms Transitioning Between Financial Vulnerability Categories

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Jayce Stabel is a current graduate student in Agricultural Economics department here at K-State. His thesis research has primarily focused upon the topic of farm financial stability and underlying factors that influence the health of Kansas farms. He is currently using data from the Kansas Farm Management Association to develop matrices of Markov Chain probabilities to better understand the likelihood of farm transitions to undesired financial states. This area of research will be of interest to financial, political, and production enterprises. Born in Oklahoma and raised in southwestern Kansas, Jayce has been a part of swine, beef, and grain production on his family farm in Lakin, KS. He attended and completed his Bachelor's Degree in Agronomy from Kansas State University in 2014.

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Dr. Terry Griffin is the cropping systems economist specializing in precision agriculture since joining Kansas State University in February 2015. He earned his bachelor's degree in agronomy and master's degree in agricultural economics from the University of Arkansas and his Ph.D. in Agricultural Economics with emphases in spatial technologies and farm management from Purdue University. He developed methods to analyze site-specific yield monitor data from field-scale experiments using spatial statistical techniques. Terry is a charter member of the International Society of Precision Agriculture. He received the 2014 Pierre C. Robert International Precision Agriculture Young Scientist Award for his work in data utilization. He has also received the 2012 Conservation Systems Precision Ag Researcher of the Year and the 2010 PrecisionAg Awards of Excellence for Research.

Abstract/Summary

A 20-year subset of the Kansas Farm Management Association (KFMA) dataset was evaluated to determine the probability of farms transitioning between profitability levels. Although it is intuitive that farms can go from one profitability level to a higher (or lower) level, it was not clear how often farms transitioned between these levels. We present the probabilities and offer insights into what factors contributed to persisting within the current profitability level or moving to another level.

Kansas Farm Financial Vulnerability

Financial Rank Transitional Probabilities of KFMA Farms

BY
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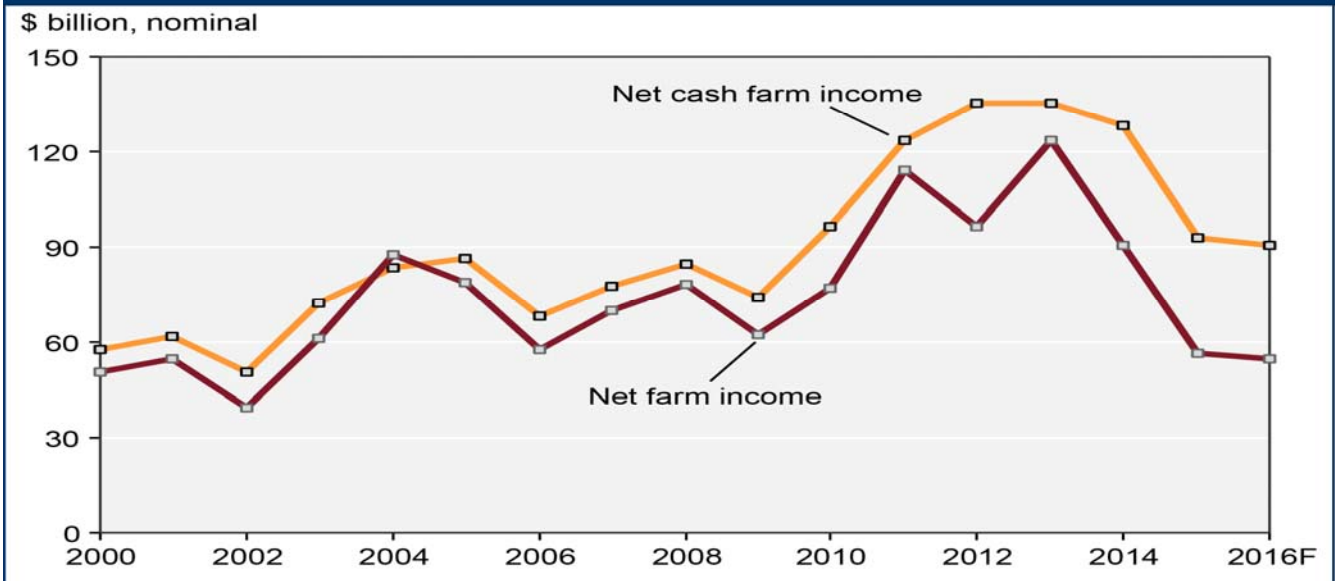
Motivation

- Farming is a capital intensive enterprise with 87% of assets being comprised of land and machinery
- According to the USDA Ag Forecast 2016 and 2017 are expected to continue the trend that began in 2013 of decreasing Net Farm profits
- New Basel Capital Accord increased bank scrutiny leading to tighter lending rules and equity requirements
- Currently, NPV and Loss-Based Method loan evaluation methods are common
- Is this a fair method to estimate farm loan default probabilities?

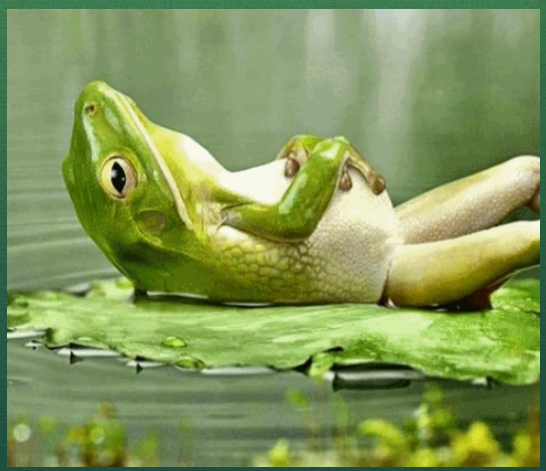
Net farm income and net cash farm income, 2000-2016F



Note: F = forecast. Data for 2015 and 2016 are forecasts.
Source: USDA, Economic Research Service, Farm Income and Wealth Statistics.
Data as of February 9, 2016.

What are transitional probabilities?

- Use transitional probabilities to determine farm persistence
- The likelihood of an enterprise persisting in its current financial ranking or transitioning to a different rank
- Conditional upon only the most recent rank

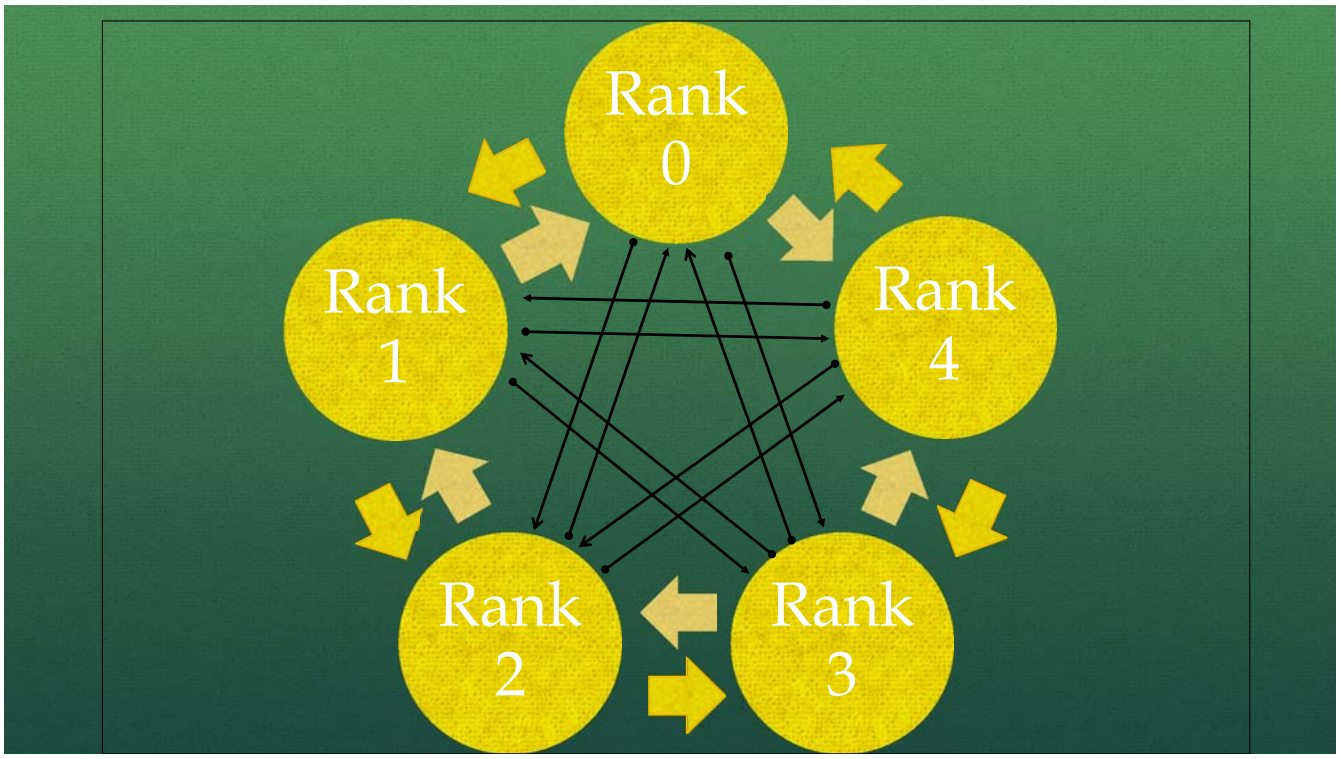


Methods

- KFMA Data for the years of 1993-2014, were subjected to several transformation
  - A Kansas FarmLand Index was created using NASS land values to inflate or deflate KFMA farmland values due to the stair-step like nature of the records
    - 5 year intervals were left unchanged
  - Adjusted Assets values were created and incorporated into the farm debt to asset ratio
- Once the data was prepared a state-wide analysis was performed to determine the long run transitional probabilities
- Matrices were created to determine the likelihood of farm transitional probabilities, conditional upon only the previous year's farm rank

Ranking System

- The ranking system was rather simple
  - Using the lending industry standard benchmark of Debt to Asset ratio of 0.4 and the state-wide average net farm income per acre
- Four Different Ranks were created:
  - Rank 1: Farms with above average NFI/Ac. and a D/A ratio below 0.4
  - Rank 2: Farms with below average NFI/Ac. and a D/A ratio below 0.4
  - Rank 3: Farms with above average NFI/Ac. and a D/A ratio above 0.4
  - Rank 4: Farms with below average NFI/Ac. and a D/A ratio above 0.4
- NFI/Ac. was the reported income per acre after operating expenses were removed divided by the number of Total Operated acres



Data Summary

- 52% of all Kansas Farms from 1993-2014 were below the 0.4 D/A ratio
- Average of 7 years of KFMA participation
- Farm type is determined by percentage of labor designated to production; however, grain farms may be diversified and have other types of production

Year	Operator Age	Primary Crop	Owned Acres
1993	50.5	37% Wheat-NI	503.85
2005	55.3	32% Wheat-NI	625.51
2014	57.49	30 % Wheat-NI	714

Results

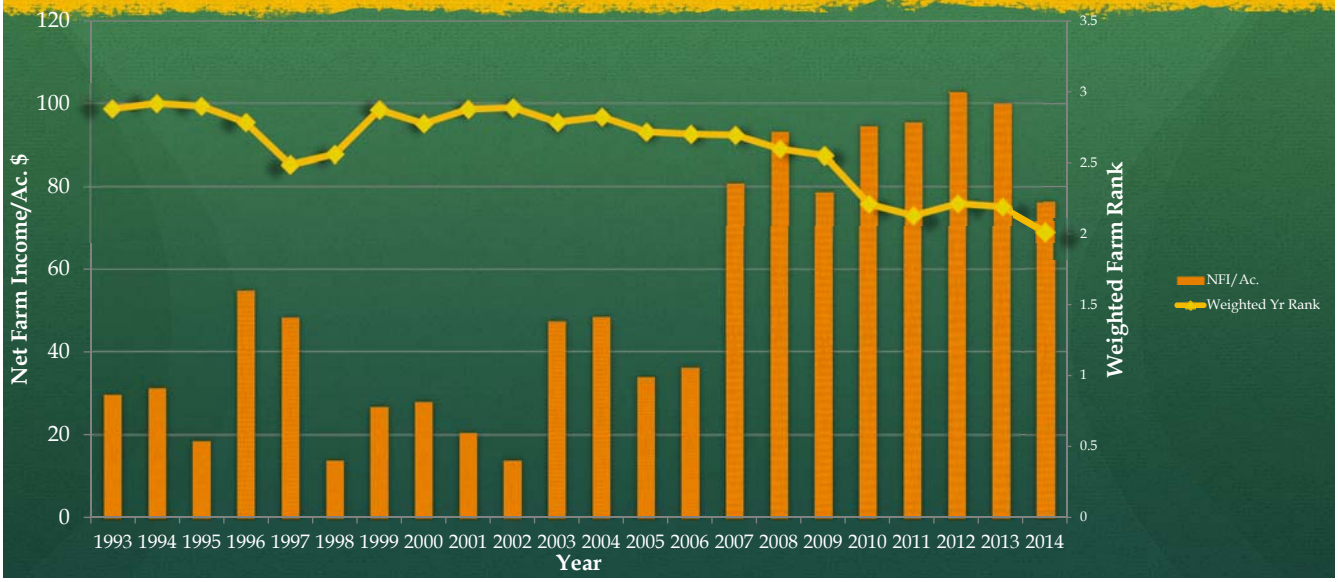
Long Run Transition

RANK	0	1	2	3	4
0	**0.92**	0.03	0.01	0.03	0.01
1	0.15	**0.67**	0.09	0.07	0.02
2	0.21	0.49	**0.21**	0.05	0.04
3	0.19	0.10	0.01	**0.56**	0.13
4	0.23	0.07	0.02	0.42	**0.26**

****Rank	
1	If NFI/ac. Exceeds $0 and D/A is below 0.4
2	If NFI/ac. Is below $0 and D/A is below 0.4
3	If NFI/ac. Exceeds $0 and D/A is above 0.4
4	If NFI/ac. Is below $0 and D/A is above 0.4

Distribution of Farm Ranks

NFI/Ac. vs. Weighted Yr. Rank



Conclusions

- Over the 23 year time span from 1993 to 2014 Kansas Farms within the KFMA data set exhibited financial persistence indicating that management techniques can impact stability
- Further research in identifying the characteristics of the farms in this study that persisted would be beneficial.
- Some potential variables of interest would be
  - Farm progressiveness
  - Marketing options
  - Diversification
  - Spatial Variance
  - Operator experience and farm age
  - Farm Risk Aversion

Questions

Thank you for your time.

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YEAR	Adjustment	YEAR	Adjustment
1993	88%	2004	106%
1994	91%	2005	100%
1995	92%	2006	103%
1996	104%	2007	106%
1997	117%	2008	113%
1998	116%	2009	113%
1999	115%	2010	92%
2000	109%	2011	106%
2001	108%	2012	118%
2002	108%	2013	130%
2003	109%	2014	138%

Farm Description

Year	Operator Age	Acres Owned	Primary Crop
2005	55.3	625.51	32% Wheat-NI
2006	55.55	660	34% Wheat-NI
2007	55.53	635.16	32% Wheat-NI
2008	55.43	707.2	34% Wheat-NI
2009	55.8	710.23	29% Wheat-NI
2010	54.46	782.94	29% Soybeans-NI
2011	55.76	743.45	28% Wheat-NI
2012	56.411	685.39	31% Wheat-NI
2013	56.82	750	31% Wheat-NI
2014	57.49	714	30 % Wheat-NI