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A Structural Equation Model of Farm Performance

Eric T. Micheels, University of Saskatchewan

Nicholas D. Paulson, University of Illinois

Tristan Skolrud, University of Saskatchewan



ACE Department of
Agricultural and
Consumer Economics

farmdocDAILY

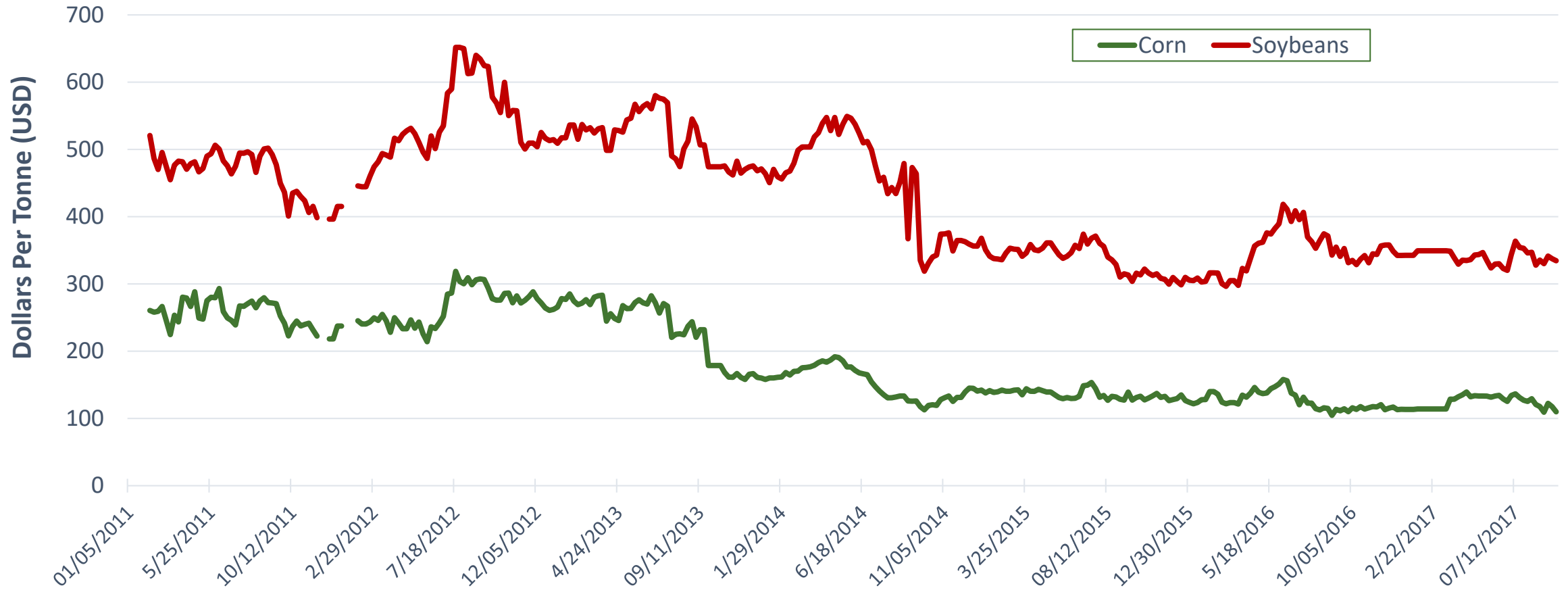
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Motivation

- What are the drivers of farm performance?
 - Is there a 'CEO effect' on farms?
 - Performance is a result of decisions made by manager
 - Returns per function?
- Do returns to managerial abilities change when the environment changes?

Different price environments

#2 Corn and #1 Soybean Cash Price, On rail Minneapolis



Source: Government of Saskatchewan

Previous Research

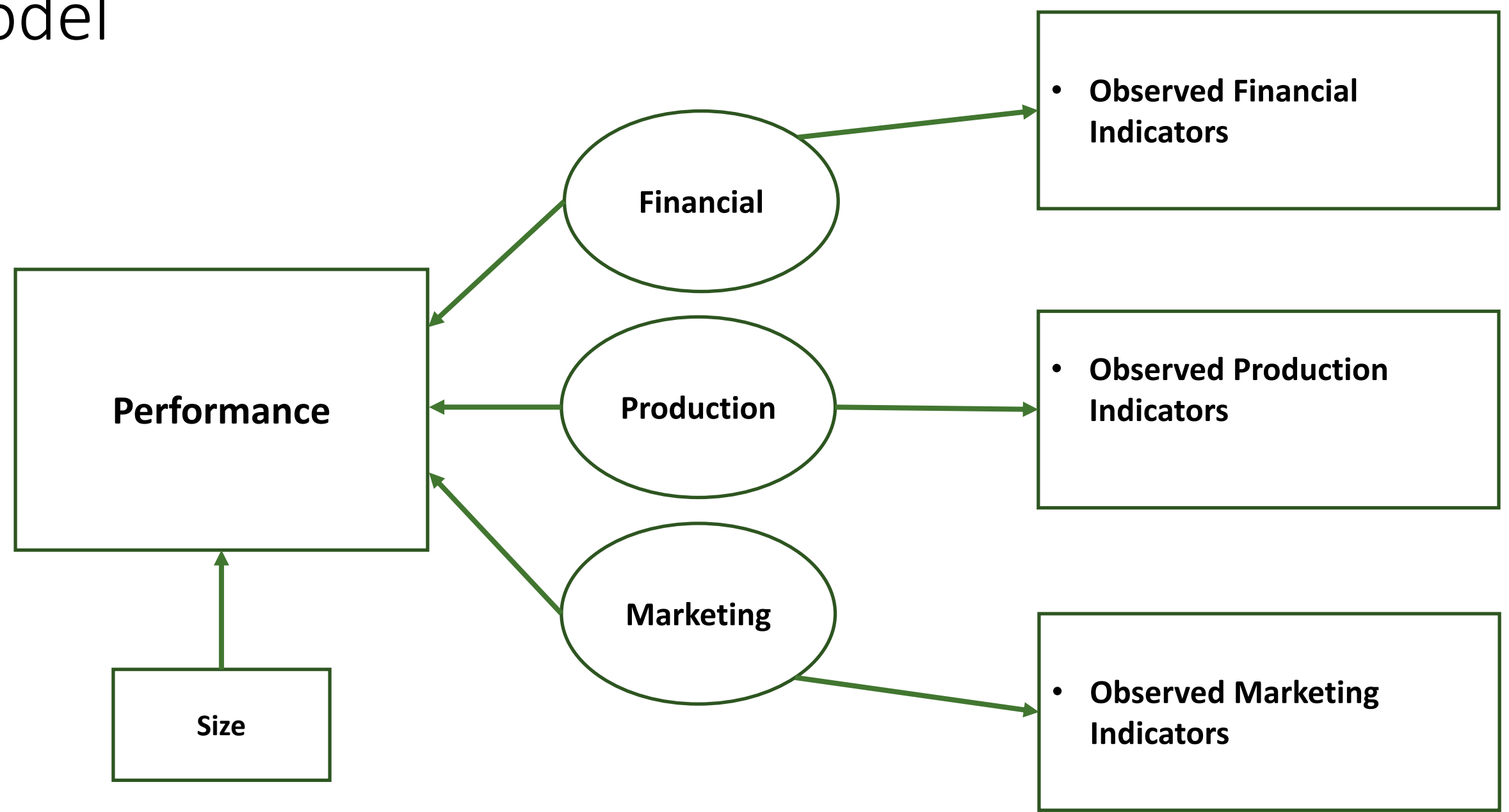
Ford and Shonkwiler (1994)

- Modeled dairy performance as a Structural Equation Model
- Financial, Herd, and Crop (feed) management
- Financial management skill is (directly) unobservable
 - Observable factors or indicators:
 - Equity to asset ratio
 - Operating margin
 - Interest expense ratio
 - Debt per cow

Our Approach

- Returns to managerial capability
 - More highly skilled/capable farm managers/operators will earn higher returns to those management capabilities
- For Midwestern grain operations, what matters is capability in making
 - Financial decisions
 - Production decisions
 - Marketing decisions

Model



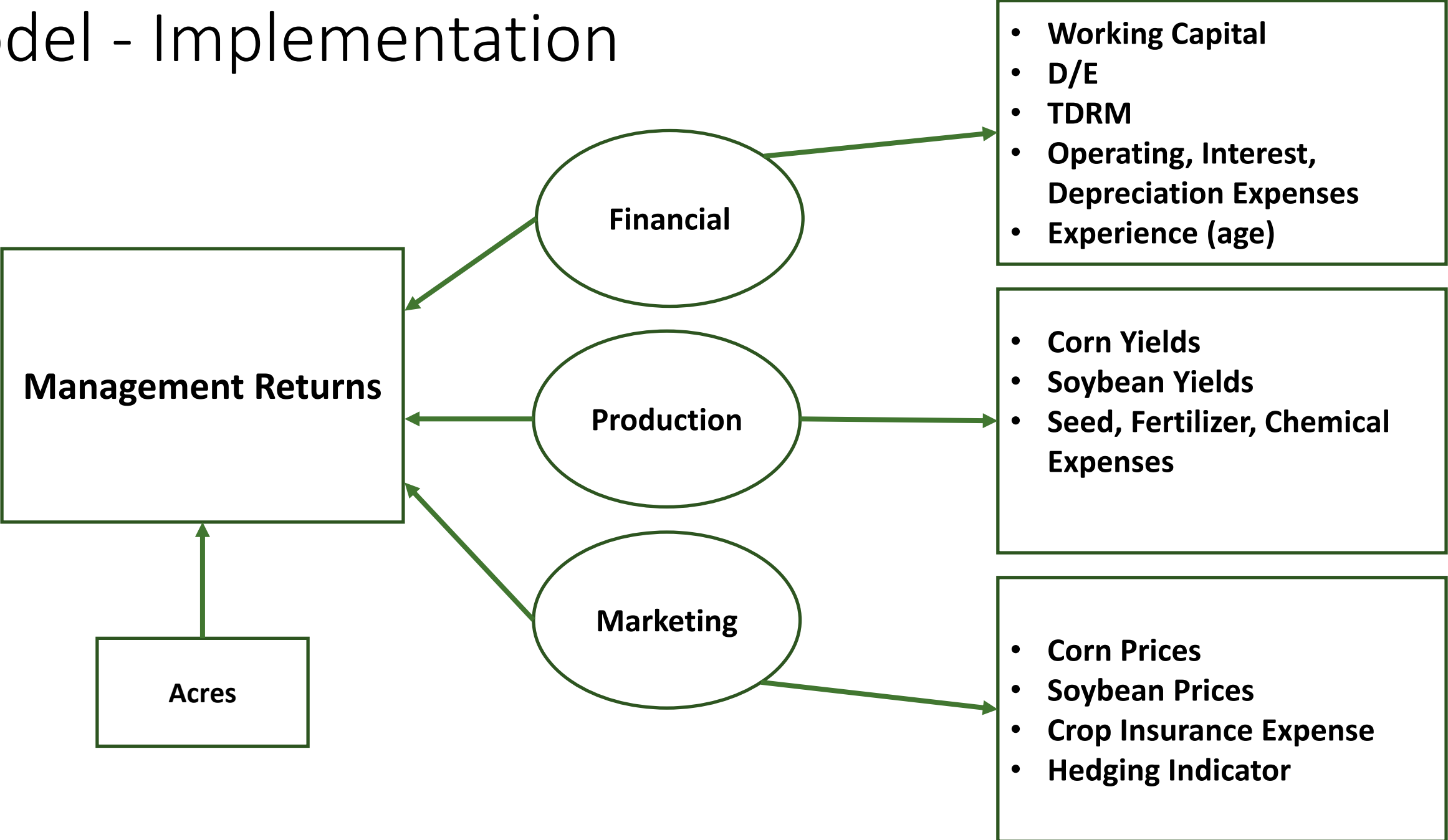
Data

- IL FBFM cooperators in 2012 and 2016
 - ~1,000 commercial grain operations each year
 - Corn and soybeans are primary crops, at least 200 acres
 - Certified, audit quality financial statement records, crop yields, and prices received
- Environments
 - 2012 – high prices and very low yields
 - 2016 – lower prices, high yields

Summary Statistics

Variable	2012 (N = 1,025)	2016 (N = 1,016)
Operators	1.05	1.07
Age (primary)	56.07	57.8
Acres	1,123	1,169
Corn Yield/Soy Yield	119.8/48.93	216.8/64.7
Corn Price/Soy Price	6.48/13.27	3.59/9.48
Working Capital (\$/acre)	761.20	\$523.90
D/E	0.35	0.44
TDRM (\$/acre)	\$210.00	\$27.22
Crop Insurance (\$/acre)	\$20.15	\$17.31
Operating (\$/acre)	\$508.40	\$470.40
Seed (\$/acre)	\$86.15	\$92.27
Fertilizer (\$/acre)	\$135.80	\$101.9
Management Returns (\$/acre)	\$223.20	-\$33.02

Model - Implementation



Results – Measurement Component

Estimates		2012	2016
Financial	WorkCap	0.7470 ***	0.601 ***
	D/E	-0.5430 ***	-0.500 ***
	TDRM	0.6370 ***	0.597 ***
	Oper	-0.3000 ***	-0.521 ***
	Int	-0.4800 ***	-0.634 ***
	Dep	0.0730 **	0.054
	Age (Exp)	0.3230 ***	0.213 ***
Production	CornYld	0.1020 ***	0.174 ***
	SoyYld	0.0520 *	0.143 ***
	Seed	0.9070 ***	0.939 ***
	Fert	0.9260 ***	0.887 ***
	Pest	0.7700 ***	0.837 ***
Marketing	CornP	0.8450 ***	0.065
	SoyP	0.4040 ***	0.002
	CropIns	-0.0300	0.517 ***
	Hedge	-0.0100	0.202 ***

Correlations	2012	2016
WorkCap	0.747	0.601
D/E	0.543	0.500
TDRM	0.637	0.597
Oper	0.300	0.521
Int	0.480	0.634
Dep	0.700	0.054
Age (Exp)	0.323	0.213
CornYld	0.103	0.174
SoyYld	0.052	0.143
Seed	0.907	0.939
Fert	0.926	0.887
Pest	0.770	0.837
CornP	0.845	0.065
SoyP	0.404	0.002
CropIns	0.030	0.517
Hedge	0.011	0.202

Results – Structural Component

Estimates	2012	2016
Acres	0.500 ***	1.183 ***
Financial	0.215 ***	0.136 **
Production	0.295 ***	-1.108 ***
Marketing	0.126 ***	-0.076
Constant	0.124	-1.729 ***

- Importance of Financial ability under range of conditions
- Production ability important under production stress (2012 drought)
- Marketing importance with in-year price volatility

Conclusions

In tight margin environments impact of farm size on management returns is greater

Inconsistent results regarding returns to marketing across price environments

Should farmers rebalance management skills portfolio?

- We invest in areas of strength (Levinthal and March, 1993)

Next steps

- Persistence across other price environments
 - Control for 2012 drought?
 - Include additional years, tests for persistence in management skill/ability
- Effect on farm size in future?
 - Do better managers grow at different rates?
- Are there better methods to measure marketing practices?
- Application to different farming contexts
 - Crops/Livestock
 - Open market/Supply managed