



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Evaluating Cost of Production of Maine Dairy Farms Using an On-Site Interview

Dylan Bouchard, University of Maine, graduate student, Dylan.Bouchard@maine.edu

Dr. Xuan Chen, University of Maine, assistant professor, Xuan.Chen@maine.edu

Dr. Gary Anderson, University of Maine, extension professor, GaryA@maine.edu

Julia McGuire, University of Maine, Ph.D Candidate, Julia.McGuire@maine.edu

Dr. George Criner, University of Maine, associate professor, George.Criner@maine.edu

Dr. Dave Marcinkowski, University of Maine, associate professor and extension specialist, Dave.Marcinkowski@maine.edu

*Selected Poster prepared for presentation at the
2015 Agricultural & Applied Economics Association and Western Agricultural
Economics Association Joint Annual Meeting, San Francisco, CA, July 26-28*

Copyright 2015 by Dylan Bouchard, Xuan Chen, Gary Anderson, Julia McGuire, Dr. George Criner and Dr. Dave Marcinkowski. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

Evaluating Cost of Production of Maine Dairy Farms Using an On-Site Interview

Dylan Bouchard, Dr. Xuan Chen, Dr. Gary Anderson, Julia McGuire, Dr. George Criner, Dr. Dave Marcinkowski

University of Maine, School of Economics

July 2015

Motivation

- All six New England states have witnessed a decline in number of farms and higher average production since 2008.
- Given the increased productivity of New England dairy farms, the question arises of which inputs are most influential on productivity.
- This study aims to assess the economies of scale in the Maine dairy industry and verify the necessity of Maine's tier-pricing program.

Data

- An on-site interview approach was used to accurately measure dairy's farms' costs of production.
- Our dataset is a cross-section of 40 farms from the 2013 production year.
- Several previous studies of Maine dairy cost of production used a mail survey approach and found that dairy farmers often miscalculated or overestimated their costs.
- Categories of operating costs included hired labor, dairy feed, machinery rent/lease, machinery repairs, fuel, breeding, veterinary, medicine, milk marketing, dues, bedding, licenses/registration, utilities, milkroom supplies, production testing, fertilizer/lime/sprays, repairs, property taxes, interest, insurance, and miscellaneous livestock expenses.
- To test for normality, we use Q-q plots and statistical tests called Kolmogorov-Smirnov, Cramer-von Mises, and Anderson-Darling tests.

Figure 1: Q-Q plot of SRBE before outlier removal

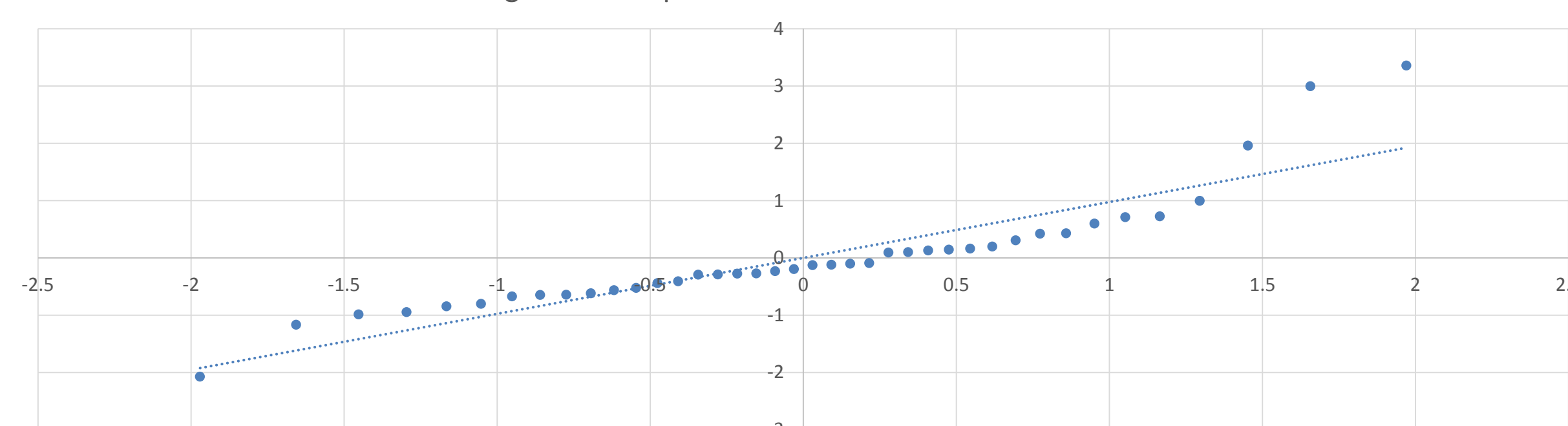
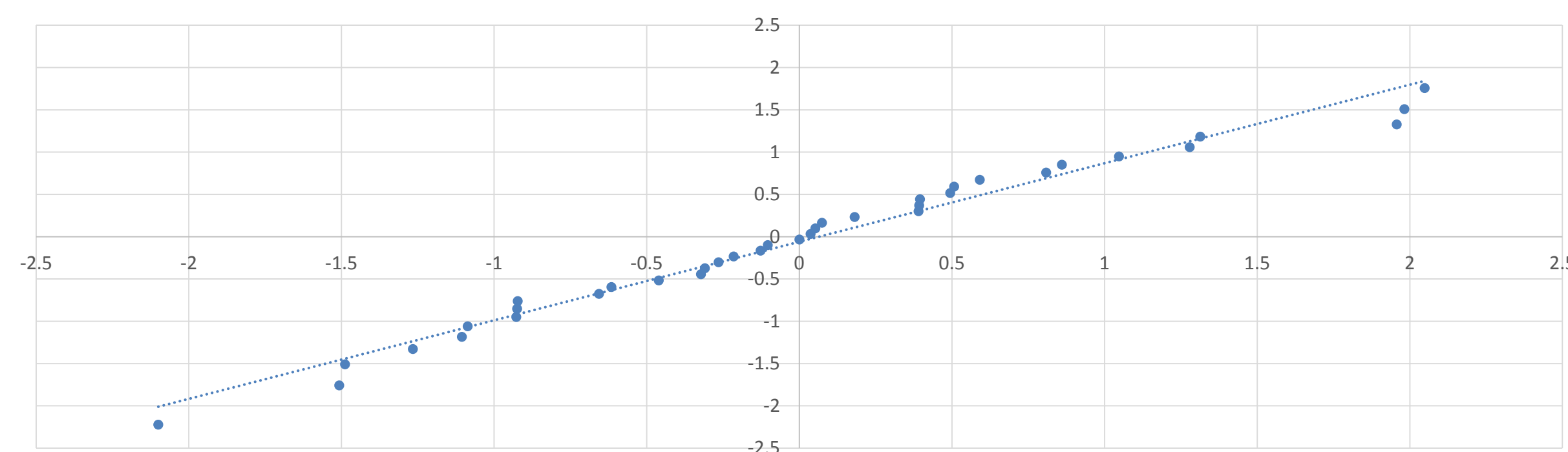


Figure 2: Q-Q plot of SRBE after outlier removal



- Before outlier removal, the tests indicate the data is non-normal, and three outliers are present.
- After removing outliers, our tests suggest the data follows a normal distribution, as can be seen in Figure 2 above.

Methods

Cost Comparison Across Farm Size and Year

- Maine has a unique tier-pricing program, where farms receive subsidies based on which 'tier' they fall into.
 - Tiers are categorized by production level, where tier 1 represents the smallest farms and tier 4 represents the largest farms.
- We define short-run breakeven price (SRBE) as cash operating costs per cwt for the sampled production year.

Average SRBE by tier for 37 farms in 2013

Farm size	Tier 1	Tier 2	Tier 3	Tier 4
SRBE	\$25.21	\$24.03	\$22.19	\$21.84

Average SRBE price by tier for 39 farms in 2010

Farm size	Tier 1	Tier 2	Tier 3	Tier 4
SRBE	\$19.64	\$20.36	\$18.01	\$17.83

One can see that average SRBE increased substantially for each tier between 2010 and 2013.

- Further, it is evident that costs per cwt decrease as farm size is increased, suggesting economies of scale exist in the Maine dairy industry.

Production Function Estimation

- We estimate a modified Cobb-Douglas production function where dummy variables are incorporated to reflect production scale and production year.
- Our dataset is an unbalanced panel with 39 farms from 2010 and 40 farms from 2013.
- In our model, output is a function of five inputs, production level, and production year:

$$y = f(\text{cows, feed, labor, capital, fuel, farm size, time})$$

- Number of cows is an estimate retrieved during farm interviews.
- Feed, labor, and capital data contain only expenditures on each input rather than specific input quantities.
 - Thus, input expenditure is used as a proxy for input quantities in our model.
- Positive coefficients are expected for each coefficient estimate.
 - The estimated coefficient for each input can be interpreted as the input's corresponding output elasticity.
 - The functional form yields a constant output elasticity with respect to each input, all else equal.

Results & Discussion

- Cows, feed, labor, and fuel are all significant at the 5% level with correctly hypothesized coefficient signs.
 - 1% increase in cows is associated with a 0.56% increase in milk output.
 - 1% increase in feed is associated with a 0.28% increase in total milk output.
- The coefficient values suggest cows are the most influential input in producing milk, as was expected.
- Feed is found to be the second most influential input.
- The capital and year variables were found to be insignificant.
- Summing the estimates for each input yields a value less than 1, implying decreasing returns to scale.
- Overall, the modified Cobb-Douglas specification seems appropriate for our dataset.

Estimation Results: Cobb-Douglas Production Function

Variable	Coefficient	Standard Error
Cows	0.5637***	0.0884
Feed	0.2789***	0.0682
Labor	0.0435***	0.0104
Capital	-0.0133	0.0087
Fuel	0.0498**	0.0247
Large	0.2031**	0.0636
Small	-0.1157*	0.0807
Year	-0.0161	0.0443
<i>R-square=.9851, F=577.2, n=79</i>		

*, ** and *** represent significance levels of 10%, 5% and 1% respectively

Acknowledgements

This study is sponsored by Maine Department of Agriculture, Conservation, and Forestry and the Maine Milk Commission.

