Aggregate Price Indexes for Farm Products

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Selected Poster prepared for presentation at the Agricultural & Applied Economic Association's 2014 AAEA Annual Meeting, Minneapolis, MN, July 27-29, 2014.

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Objective

This poster outlines future price index methodology research questions NASS will be working on. Special attention is devoted to the role of the price relative estimator. Example index calculations for the Feed Grain Prices Received Index are provided using three different price relative estimators.

Background

The United States Department of Agriculture's National Agricultural Statistics Service (NASS) conducts hundreds of surveys each year on topics related to the U.S. agricultural industry. One important set of data published by NASS is the Prices Received and Prices Paid Index Series. These index series, as mandated by legislation, provide a measure of the general level of price change compared to a base reference period for agricultural commodities sold and farm inputs purchased by farmers.

In response to a review of its Price Index Program conducted by the Council on Food, Agricultural, and Resource Economics (C-FARE), NASS recently made several modifications to the Price Index Program. These revisions included creating a NASS Prices Program Website, which is available on the Web at `http://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Prices/index.asp`, providing comprehensive documentation for user transparency of the methodology used in the NASS Price Index Program, conducting a Voice of the Customer Initiative to acquire feedback from stakeholders, and making updates to the price index methodology. The full C-FARE report is available on the Web at `http://www.cfare.org/publications/c-fare-related-publications`.

Future Research Questions

NASS is working on a paper addressing price program index methodology. Also, NASS is conducting research to evaluate the following questions:

* What role commodity specificity plays in calculating agricultural price indexes?
* What item attributes are needed to represent all grades and qualities of a commodity?
* What is the appropriate estimator for the elementary price relative ($\frac{p_{jt}}{\bar{p}_{jR}}$)?
* What is the appropriate group-level price index formula?

Prices Received Index Formula

The group-level formula for the NASS Prices Received Index in period t is

$$I\left(\bar{\boldsymbol{p}}_R, \boldsymbol{p}_t \middle| \boldsymbol{Q}\right) = \left(\sum_{j=1}^{J} \frac{p_{jt}}{\bar{p}_{jR}} w_{jB(t)}\right) \times 100$$

where J is the number of commodities in the group-level price index, p_{jt} is the price of commodity j in period t, $\bar{p}_{jR}$ is the average price for commodity j in the base reference period, and $w_{jB(t)}$ is the weight for commodity j in the month corresponding to month t in the base weight period (e.g., January 2011 for January 2012). This price index formula is based on the price index formula developed by Bean and Stine (1924) and Rothwell (1958).

Discussion

What index methodology best represents the NASS target index? The general purpose of NASS price indexes is to measure the general level of change in the average prices producers receive for their commodities and the general level of change in average prices producers pay for their inputs.

NASS collects data to represent an all-commodity average price. Agricultural commodities can vary significantly with regards to grade, quality, utilization, variety, and substitution between periods. This creates challenges for estimating price relatives.

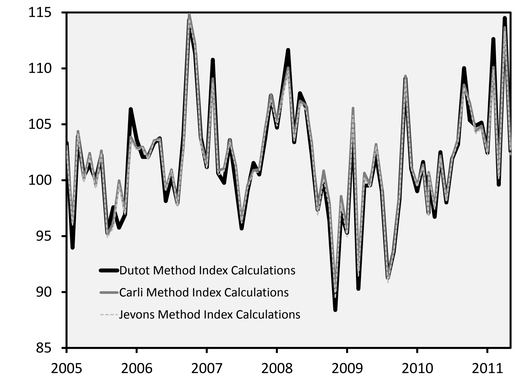
Consider price data for a commodity as in the example below. (The commodity can be thought of as a general farm product with processing varieties (white apple), fresh-market varieties (gray apple), and organic varieties (black apple).)Three potential methods could be used to estimate the price relative: 1) take the ratio of the weighted average prices in each period (the Dutot Method), 2) take the weighted average of the relative prices (the Carli Method), and 3) take the weighted geometric average of the relative prices (the Jevons Method). The estimate for the price relative under the Dutot Method is **1.57**, while the estimate for the price relative under the Carli Method is **1.73** and the estimate for the price relative under the Jevons Method is **1.71**.

base reference period price	**1**	**2**	**5**
current period price	**2**	**3**	**7**
commodity weight	**0.5**	**0.3**	**0.2**

Example with NASS Data

The graph below shows the group-level estimates for the Feed Grain Prices Received Index spanning the period 2005-2011 using the Dutot Method (the current NASS method), the Carli Method, and the Jevons Method for estimating price relatives. The average absolute percentage difference between the Dutot Method and Carli Method group-level estimates for the monthly price data presented is 0.7% with a maximum absolute percentage difference of 4.4%, while the average absolute percentage difference between the Dutot Method and Jevons Method group-level estimates for the monthly price data presented is also 0.7% but with a maximum absolute percentage difference of 4.1%. It should be noted the Feed Grain Prices Received Index depicted in the graph includes Corn, Hay, Sorghum, Barley, and Oats.

Received Index by Month, Feed Grain
United States: 1990-1992=100



References

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Rothwell, D.P. 1958. "Use of Varying Seasonal Weights in Price Index Construction." *Journal of the American Statistical Association* 53:66–77.