

Retail Food Price Forecasting at ERS: The Process, Methodology, and Performance from 1984 to 1997. Frederick L. Joutz, Robert P. Trost, Charles Hallahan, Annette Clauson, and Mark Denbaly. Economic Research Service, U.S. Department of Agriculture. Technical Bulletin No. 1885.

Abstract

Forecasting retail food prices has become increasingly important to the U.S. Department of Agriculture (USDA). This is due to the changing structure of food and agricultural economies and the important signals the forecasts provide to farmers, processors, wholesalers, consumers, and policymakers. The American food system is going through fundamental structural changes. It is unclear how these changes will affect the cyclical variation of food price markups and translate into changes in retail food prices. The only government entity that systematically examines food prices and provides food price forecasts (on an annual basis) is the Economic Research Service, an agency of USDA. This report explains the ERS procedures in forecasting food prices and assesses how changes in the current procedures would improve the quality of the forecasts.

Authors

Frederick L. Joutz and Robert P. Trost are with the Department of Economics, The George Washington University, Charles Hallahan is with the Information Services Division, Economic Research Service, and Annette Clauson and Mark Denbaly are with the Food and Rural Economics Division, Economic Research Service.

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Preface

ERS periodically evaluates current forecasting procedures for the Consumer Price Index (CPI) for food to determine if alternative procedures should be incorporated. In the 1980's, ERS researchers developed several quarterly econometric models for predicting activity in agriculture, food marketing, and food consumption. The quarterly model described by Westcott and Hull (1985) had four modules: a commodity outlook model, a farm income model, a food price model, and a food consumption model. The equations in this model were estimated using OLS and then fit into a model using three-stage least squares, imposing the aggregation restrictions for the food price components in the CPI. This model is no longer in use, because of resource constraints and because of a change in the forecast focus from quarterly projections to annual. However, components from this earlier quarterly model are currently used to forecast beef, pork, poultry, eggs, and milk retail prices.

Two different five-variable VAR models were tested in 1989 by Elitzak and Blisard for meat and seafood retail prices. These models were compared against one-quarter-ahead USDA forecasts from the third-quarter of 1986 until the second-quarter of 1988. For these eight quarters, the two VAR models performed better than the USDA forecasts.

Hahn (1989) tested three alternative models for price transmission in the beef and pork industries. The first model required that current price effects be symmetric; the second model required that lagged price effects be symmetric; and the third model measured the importance of asymmetric feedback from the retail and farm prices to the wholesale price. As a result of this study, the beef and pork model estimates implied that asymmetry is an important part of meat price transmission. The structural equation estimates for both beef and pork models found that the wholesale level is the leading level, and the estimates implied that meat price transmission processes may be more complex than found in previous studies. Results from this model are currently used along with the earlier quarterly model forecasts to forecast beef and pork retail prices.

In addition to commodity analyst forecasts for beef, pork, poultry, eggs, fresh fruits, and fresh vegetables, ERS has used ARIMA models since 1995 to verify that forecasts made by the commodity analysts are statistically sound and within a 95-percent confidence level. An initial assessment by Denbaly was conducted on seven of the food index components not forecast by commodity analysts. The results from that study concluded that forecasts computed using ARIMA models were more reliable than forecasts computed using the ERS model.

The current study was undertaken to determine if more reliable forecasts of retail food prices could be obtained from methods not currently used by ERS forecasters. The intentions of this study were to evaluate past forecasting performances, identifying areas where improvements could be made, and to document the current forecasting procedures to users of the information. In this study, historical ERS forecasts are evaluated and compared with alternative time series models.

Summary

The only government entity that systematically examines food prices and provides food price forecasts (on an annual basis) is the Economic Research Service (ERS), an agency of USDA. This study explains the current forecasting procedures used by ERS, evaluates past forecasting performance, and creates an up-to-date set of historical forecasts. This study compares the ERS procedures with alternative univariate time series models. This was accomplished by generating out-of-sample forecast errors, computing four accuracy statistics, and performing a statistical test of forecast reliability. The results show that the alternative univariate forecasts had a lower Root Mean Square Error (RMSE) for seven price indexes and the ERS forecasts had a lower RMSE for three indexes. In the other food items, there was no significant difference between the forecast error variances.

The U.S. Department of Agriculture forecasts annual changes in the major categories of the Consumer Price Index (CPI) for food. These forecasts are used in the President's annual budget for designing food and agricultural programs, such as the Food Stamp Program, which cost \$19.6 billion in 1997.

Identifiable users of the ERS food price forecasts include USDA's Chief Economist and Secretary's Office, the Federal Reserve Board, the U.S. Congress, other government agencies, the news media, the food retailing and processing industries, private consultants, companies, and universities. Food service purchasing agents from hospitals, universities, State institutions, and military organizations also use the ERS food price forecasts to support their budget requests and expenditures.

Forecasting retail food prices has become increasingly important to USDA due to the changing structure of food and agricultural economies and the important signals the forecasts provide to farmers, processors, wholesalers, consumers, and policymakers. The American food system is going through fundamental structural changes. It is unclear how these changes will affect the cyclical variation of food price markups and translate into changes in retail food prices.

There are three modern approaches to forecasting: (1) judgmental approach, (2) extrapolatory approach, which includes Box Jenkins and smoothing techniques, and (3) explanatory approach, which includes regression techniques. For food, changes in farm to wholesale to retail price spreads, changes in general market conditions (costs for labor, packaging, marketing and advertising), changes in competition among industries, changes in the general inflation rate, and changes in supply, demand, and consumption patterns, suggest that food price forecasts may benefit from a combination of all three forecasting methods.