Forecasting Consumer Price Indexes for Food: A Demand Model Approach.
By Kuo S. Huang, Food and Rural Economics Division, Economic Research Service, U.S. Department of Agriculture. Technical Bulletin No. 1883.

Abstract

Forecasting food prices is an important component of the U.S. Department of Agriculture's short-term outlook and long-term baseline forecasting activities. A food price-forecasting model is developed by applying an inverse demand system, in which prices are functions of quantities of food use and income. Therefore, these quantity and income variables can be used as explanatory variables for food price changes. The empirical model provides an effective instrument for forecasting consumer price indexes of 16 food categories.

Keywords: Food price forecasts, inverse demand system, autoregressive model.

Acknowledgments

The author thanks Mark Denbaly, Paul Westcott, Albert Reed, and Annette Clauson for helpful review of the earlier drafts of this report, Martha Evans for editorial advice, and Anne Pearl for text layout and cover design.

1800 M Street, NW
Washington, DC 20036-3851

February 2000

Contents

Summary

A food price-forecasting model is developed to provide information about how changes in the quantities of food use affect consumer food prices. The model specification explicitly recognizes that lags between farmers' decisions on production and commodities marketed may predetermine quantities, with price adjustments providing the market-clearing mechanism. This model, by incorporating economic rationale specification, is an alternative approach to the commonly used time series model for food price forecasts. The empirical model, represented by a set of price equations with estimates expressed as price flexibilities, provides an effective instrument for forecasting consumer price indexes of 16 food categories by using 6 aggregate food quantities as input information.

According to the model estimates, for example, a marginal 1-percent increase in the quantity of red meats would result in price decreases of 0.91 percent for beef, 1.42 percent for pork, and 0.27 percent for other meats. On the other hand, a marginal 1-percent increase in the quantity of poultry would result in a price decrease of 0.84 percent for poultry. Regarding the cross-quantity effects, an estimated cross-price flexibility between two food categories shows the percentage change in the amount consumers are willing to pay for one food when the quantity of another food increases by 1 percent. For example, the cross-price flexibility of poultry with respect to the quantity change of red meats is -0.40 percent, and the cross-price flexibilities of beef, pork, and other meats with respect to the quantity change of poultry are -0.15, -1.03, and -0.42 percent. The negative values of these cross-price flexibilities suggest that red meats and poultry are substitutes.

Regarding forecasting capability of the model, the estimates of goodness of fit (R^2) in each price equation are satisfactory. All estimates of R^2 are higher than 0.91, and in 14 of 16 cases, R^2 is higher than 0.95. Also, in the simulation over the sample period, the measures of root-mean-square errors as a percent of sample mean are in a range between 0.37 and 1.98 percent, indicating that the conformity of the fitted prices with the sample observations appears reasonably good. These statistical results suggest that the estimated inverse demand model alone can be used for price forecasts.

Finally, a spreadsheet model for forecasting consumer food prices was developed that users can easily implement for timely outlook and market analysis. For conducting forecasting, one may use the prior information on quantities of food use and per capita income to forecast food prices. For program analysis, one may assume various scenarios of changes in the prior information and then conduct simulation experiments for evaluation of the program effects. The accuracy of the forecasts of consumer food prices, however, depends on the reliability of prior information on quantities of food use and per capita income in the future.