Conclusions

The results of this examination into quarterly retail food price forecasting at ERS over the period 1984 through 1997 provide four main conclusions for improvement in the forecasting process and methodology. The conclusions range from those directly based on the statistical results to statements about the understanding of the forecasting process within ERS.

First, the RMSE and MAE tests at the one- to four-quarter ahead horizons yield the same patterns of results. At each horizon, between 16 and 18 of the 23 alternative models have lower test results. This implies that the dispersion of their forecast errors is smaller than for the ERS forecast errors. The results are essentially the same for each CPI series. The ERS forecasts RMSE are lower for four retail price series at all horizons: Dairy Products, Fruits and Vegetables, Fresh Vegetables, and Processed Fruits. The last three of these are the CPI series which appear to be the most difficult to predict (with the exception of Eggs and Nonalcoholic Beverages.) There is little difference between the ERS and alternative model RMSE's across all four horizons for three price series: All Food (which is the single most important index to forecast), Meats (composite), and Nonalcoholic Beverages. Otherwise, the alternative model appears to have lower RMSE for the remaining CPI indexes. In particular, the CPI components Food Away from Home, Other Meats, Poultry, and Fats and Oils suggest that the alternative model can help reduce the RMSE by 50 percent or more at the different horizons.

Second, the weak form forecast efficiency tests reveal how well the forecasts performed at the one-quarter-ahead horizon. There was an insufficient number of observations to conduct the proper testing at more than one quarter ahead. The alternative model could not be rejected as weakly efficient for 16 of the 23 CPI components (12 at 5 percent and 4 at 1 percent.) The ERS forecasts are weakly efficient for only nine components (six at 5 percent and three at 1 percent.) The forecasts by ERS and the alternative model are weakly efficient for the same seven components: Fish and Seafood, Dairy Products, Fresh Vegetables, Processed Fruits and Vegetables, Processed Vegetables, Sugars and Sweets, and Nonalcoholic Beverages. In a number of cases, there is substantial imprecision in the parameter estimates permitting the forecasts to be relatively accurate. The alternative model forecasts are weakly efficient for the same four series in which the RMSE is better by more than 50 percent over the ERS forecasts.

Third, the Granger and Newbold test is used to test if the differences in RMSE are statistically significant. The alternative forecasts are found to be smaller for seven of the CPI components: Food Away from Home, Poultry, Fats and Oils, Processed Vegetables, Sugars and Sweets, Cereals and Bakery Products, and Other Foods. ERS' forecast RMSE is significantly lower for three of the four CPI components mentioned above with the exception of Dairy Products. This test is consistent with a more formal analysis of the results stated in the first conclusion.

These first three conclusions are based on the approach, "Which forecast model works best?" In practice, forecast evaluations of this kind find that no single forecasting approach works best for all variables or at all horizons. A second approach asks whether the competing forecasts can be profitably combined to yield a composite forecast that is superior to the individual forecasts. Analyzing the individual forecasts and integrating their relative strengths can produce better forecasts and more effective decisions.

The fourth conclusion is based upon forecast combination exercises for the 23 CPI components. The results suggest that the ERS and alternate forecasts can be merged into a simple weighted average, with the weights (constrained) summing to unity for 17 of the CPI components. These forecast combinations produce lower RMSE than the ERS forecasts by 20 percent or more for 18 and 16 components when the weights are unconstrained and constrained, respectively. There is value in using the alternative time series models as a means of improving the forecast errors. However, time series model predictions are based solely on the past behavior of the variable estimated and that variable alone. By combining the ERS and alternative forecasts, the changes in consumer tastes and preferences along with structural changes in selected food industries would be included in the forecasts.

By comparing historical ERS forecasts with alternative forecasting models, this study found that no single forecasting approach works best for all variables or at all horizons. Although the alternative time series model RMSE was generally lower than the ERS forecasts, the time series model did not capture changes in several of the food categories from 1992 through 1997. The alternative time series models that were tested were not perfect, but added information to the analysts' forecasts and ARIMA models that are currently used. In future work, information past the farmgate should be analyzed to determine what can be added to the retail food price forecasting methods.