

Modeling Monthly Coconut Prices in Sri Lanka using Non-Linear Time Series Models

G A C N Priyadarshani^{1*}, C D Tilakaratne¹, A A Sunethra¹ and D K Oshani²

¹Department of Statistics, University of Colombo, Sri Lanka

²Department of Manpower and Employment, Battaramulla, Sri Lanka

*Corresponding Author (Email: chandimanilanthi@gmail.com)

Abstract

Coconut is a perennial crop which significantly contributes to the Sri Lankan economy. It is the third largest foreign exchange earner for the country. Recently Sri Lanka faced high reduction in coconut yield. Coconut prices have doubled due to the shortage. A crop shortfall and a drought have forced the country to import coconuts. The lack of the advanced models to forecast the coconut prices also may be a reason for this crisis because the industry may have not had a real idea of the pattern of the price changes. In this study two types of nonlinear time series models were fitted to retail and producer price series, separately. Finally, out of the fitted models, the best one was selected to forecast monthly producer and retail price of coconut. Monthly producer and retail price series from 1994 to 2010, showed a non-constant variance with the time. Since the Box Peirce LM test statistically confirmed that the volatility clusters are present in each return series, Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) models were fitted to both return series. Monthly coconut production was taken as an exogenous variable since cross correlograms indicate a significant correlation between each price and production. As an alternative nonlinear approach Nonlinear Autoregressive neural network with exogenous inputs (NARX) models were fitted for each price series considering production as an exogenous variable. Forecasts of producer price and retail price of coconut were obtained from each model. Since AIC (Akaike Information Criterion) values and MSE (Mean Square Error) values were in different scales among the models, Mean Absolute Percentage Error (MAPE) of prediction was used as the measure to compare the models. The results showed that the NARX model was the most appropriate model to forecast monthly producer price of coconut as well as retail price of coconut during the study period, because the smallest MAPE of prediction was given by the NARX model.

Keywords: Coconut Prices, GARCH, NARX, Time Series