Studying the behaviour of export quantities of Tuna fish in Sri Lanka

S. A. L. Sachithra[1]*, U. P. Liyanage[1] and W. M. D. N. Wijeyaratne[2]

[1]Department of Statistics & Computer Science, Faculty of Science, University of Kelaniya,
Sri Lanka
[2]Department of Zoology and Environmental Management, Faculty of Science,
University of Kelaniya, Sri Lanka
* sachithrasamarasinghe@gmail.com

Being an island in the Indian Ocean, Sri Lanka claims a large sea area and abundant fish resource with high facilitate suitable for large scale fishery industry. According to the Central Bank of Sri Lanka, the contribution of fisheries to the Gross Domestic Production (GDP) of the country ranges between 1.3% and 1.6%. Consequently, fishery industry already plays a vital role in economics and social development of Sri Lanka. Due to weather conditions, seasonal effects, changes of government tax policies and trade agreements, e.g. GSP+ and etc., there is a high fluctuation in export quantity of fishery products in Sri Lanka. Thereby, it is essential to study the variation patterns and forecast harvest and income generated by fishery products towards monitory strategy planning. Among the various types of fish, tuna is one of the species that is important in financial earnings. Out of all fisheries exports, Sri Lanka earns the highest income worth 50.8% by exporting tuna fish in 2016, according to the statistics from Ministry of Fisheries and Aquatic Development of Sri Lanka (SLMFAD). This study was conducted to analyze the export quantities of tuna fish and forecast the future export quantities. Monthly export quantities from January, 2010 to June, 2018 were collected from SLMFAD. In preliminary analysis, United States, Japan, and Canada are identified as the top countries in which Sri Lanka exports the highest quantity of tuna fish. To study the changes in export patterns and their associated relations, Statistical Change-Point Analysis was conducted. The results revealed a high correlation between the changes of export patterns with events such as country's peace restoration, economic stability, infrastructure facilities, introduction of different capacity changes and termination of development projects. Towards forecasting the export patterns time series data analysis techniques were used. Unit root tests; Augmented-Dickey-Fuller Test (ADF) and Kwiatkowski-Phillips-Schmidt-Shin test (KPSS) were used to test the stationarity of the time series data. Based on Akaike information criterion (AIC) value, SARIMA $(1,1,2)(1,0,0)_{12}$ model was identified as the best. Ljung-Box test, Jarque-Bera test and Heteroscedasticsity test were used to check the behavior of the residuals of this fitted models. Accuracy of the models were compared by root mean squared error (RMSE), and mean squared error (MSE). With 0.8485 of RMSE and 0.6038 of MSE, SARIMA $(1,1,2)(1,0,0)_{12}$ model can be considered as the most suitable model to forecast the export tuna quantity from Sri Lanka.

Keywords: SARIMA, Exporting Quantities, Change-Point Analysis, Forecasting, ARIMA