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Time series analysis and forecasting of sector-wise electricity production and consumption in Sri Lanka

B. H. H. Lakshika[*] and D. M. P. V. Dissanayaka

Department of Statistic and Computer Science, Faculty of Science, University of Kelaniya, Sri Lanka
hiruni127@gmail.com*

Electricity is one of the main power sources all over the world. Electricity can be defined as Sri Lanka's' primary breath since disparities of electricity mainly impact on country's socio and economic well-being. Therefore, it is essential to understand the electricity consumption patterns and the future capacity of electricity production for decision-making purposes. One of the study's key objectives is to estimate the appropriate model for defining and forecasting the sector-specific electricity production in Sri Lanka using an efficient and reiterative methodology based on the univariate and multivariate time series modelling approach. The other objective is to define the interrelationships between the production and consumption sectors individually. The electricity production in Sri Lanka has a national grid-primarily powered by hydropower, thermal heat, and wind power. The demand for electricity in Sri Lanka mainly depends on the activities of domestic, industrial, commercial sectors, and religious purposes. The proposed methodology was successfully applied to the monthly data related to the sector-wise electricity production and consumption (Units in GWh) in Sri Lanka over the past eighteen years from the year 2000 to 2018. Electricity production sectors were modelled by using both univariate and multivariate time series applications. Electricity consumption was modelled by using a multivariate time series approach. In the univariate approach, the Autoregressive Integrated Moving Average $(0,1,4)$(ARIMA$(0,1,4)$) model was proposed for the hydroelectricity production with Mean Absolute Percentage Error(MAPE) 17.59%, ARIMA$(0,1,3)(0,0,2)(12)$+ GARCH$(1,1)$ model was fitted for the Thermal heat sector with MAPE 11.98% and the ARIMA$(2,0,0)(1,1,1)$ model was fitted for the wind power sector with 17% of MAPE. According to these univariate analysis results, it can be concluded that there are seasonal patterns in thermal heat and wind power electricity production sectors. In this study, the existence of the correlation and cointegration of variables considered under the sectors of electricity production and consumption lead to consider a Vector Error Correction Model (VECM). The multivariate analysis shows evidence of the existence of the short term and long-term relationship between electricity production and consumption sectors separately.

Keywords: Electricity production, Electricity consumption, Univariate & Multivariate Time Series