

Artificial Neural Network based New Hybrid Approach for Forecasting Electricity Demands in Sri Lanka

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Abstract

The electricity generation and forecasting are playing a significant role to enhance national economic growth. It has a direct impact on both individual's standards of living and industrial enhancements; especially, it is a prerequisite to enhance industrialization, farming and residential requirements. As a result, most of the countries are allocating a considerable amount for power generation and forecasting from nation's annual budget. The main objective of this study is to focus on analyzing the electricity demands in Sri Lanka using a new proposed combined hybrid approach based on Artificial Neural Network.

The methodology of the study is carried as follows. In the first phase, electricity demand of Sri Lanka is forecasting based on the autoregressive integrated moving average (ARIMA) and Artificial Neural Network (ANN) approaches separately. In the next stage, the new proposed combined approach of ANN and ARIMA (ANN-ARIMA) is applied.

According to the Akaike Information Criterion, Schwarz Information Criterion and Hannan Quinn Criterion results, ARIMA(0,1,1) (R-squared : 45%, Durbin-Watson stat: 2.32) and ARIMA (1, 1, 1) (R-squared : 55%, Durbin-Watson stat: 2.03) are best models for forecasting electricity production and electricity consumption under the linear framework respectively.

As a next step, proposed ANN-ARIMA hybrid methodology is applied to forecast non-linear composite based on MATLAB training algorithms. Furthermore, the model selection results concluded that, Backpropagation Neural Network (BPNN) (1-4-1) with 0.06 learning rates and BPNN (1-2-1) with 0.04 learning rates are the best one-step-ahead forecasting for electricity production and electricity consumption respectively.

According to the empirical results, the electricity production and consumption curves went parallel trend up to 1995. However, after 1995 consumption rate has been increasing rapidly with respect to the production rate. When this is the case until 2020, it will create distortions in the Sri Lankan future. So this study is a good sign for the government and energy sources must be introduced and implemented for national power grid early as possible.

Keywords: *Electricity demand, Electricity production, Electricity consumption*