

Application of Seasonal Autoregressive Integrated Moving Average Model for Forecasting Monthly Flows in Waterval River, South Africa

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Abstract : Reliable future river flow information is basic for planning and management of any river systems. For data scarce river system having only a river flow records like the Waterval River, a univariate time series models are appropriate for river flow forecasting. In this study, a univariate Seasonal Autoregressive Integrated Moving Average (SARIMA) model was applied for forecasting Waterval River flow using GRETl statistical software. Mean monthly river flows from 1960 to 2016 were used for modeling. Different unit root tests and Mann-Kendall trend analysis were performed to test the stationarity of the observed flow time series. The time series was differenced to remove the seasonality. Using the correlogram of seasonally differenced time series, different SARIMA models were identified, their parameters were estimated, and diagnostic check-up of model forecasts was performed using white noise and heteroscedasticity tests. Finally, based on minimum Akaike Information (AIC) and Hannan-Quinn (HQc) criteria, SARIMA (3, 0, 2) x (3, 1, 3)₁₂ was selected as the best model for Waterval River flow forecasting. Therefore, this model can be used to generate future river information for water resources development and management in Waterval River system. SARIMA model can also be used for forecasting other similar univariate time series with seasonality characteristics.

Keywords : heteroscedasticity, stationarity test, trend analysis, validation, white noise

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