

Development of a method of the data generation with maintaining quantile of the sample data

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Abstract

Both the frequency and the magnitude of hydrometeorological extreme events such as severe floods and droughts are increasing. In order to prevent a damage from the climatic disaster, hydrological models are often simulated under various meteorological conditions. While performing the simulations, a synthetic data generated through time series models which maintains the key statistical characteristics of the sample data are widely applied. However, the synthetic data can easily maintains both the average and the variance of the sample data, but the quantile is not maintained well.

In this study, we proposes a data generation method which maintains the quantile of the sample data well. The equations of the former maintenance of variance extension (MOVE) are expanded to maintain quantile rather than the average or the variance of the sample data. The equations are derived and the coefficients are determined based on the characteristics of the sample data that we aim to preserve. Monte Carlo simulation is utilized to assess the performance of the proposed data generation method. A time series data (data length of 500) is regarded as the sample data and selected randomly from the sample data to create the data set (data length of 30) for simulation. Data length of the selected data set is expanded from 30 to 500 by using the proposed method. Then, the average, the variance, and the quantile difference between the sample data, and the expanded data are evaluated with relative root mean square error for each simulation. As a result of the simulation, each equation which is designed to maintain the characteristic of data performs well. Moreover, expanded data can preserve the quantile of sample data more precisely than that those expanded through the conventional time series model.

Keywords : Data generation, time series model, maintenance of variance extension

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