**A New Fractional Differencing Algorithm for ARFIMA**

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**Abstract**

In the present paper a new differencing algorithm is presented and it is applied on analysis of time series. In a recent paper, a new fractional discretization formula for fractional derivative is constructed by Tarasov [1]. This new discretization of fractional derivative is different from the classical Lubich discretization [2]. New method satisfies some important properties as universality and algebraic correspondence. So, it is an exact discretization. Motivated by the idea of using this new method for improving the models where Lubich approximation is commonly used, we consider fractional differencing part in the (Autoregressive fractionally integrated moving average) ARFIMA model. It is known that ARFIMA (p,d,q) technique is different from classical (Autoregressive integrated moving average) ARIMA model, because the researcher is able to choose the fractional order of differencing d to ensure that the resulting series is a stationary process. ARFIMA method is important due to the fact that many time series exhibit long-range dependence, but they can not fit to any ARIMA model. The ARFIMA model is designed to represent these series. So, we consider the generalized version of ARIMA which is ARFIMA with a new fractional differencing algorithm.

The new fractional differencing approach truncates the series by assuming some data zero. The method is generated by some modifications on the fractional derivative approach in [1]. The reason is the loss of a huge amount of data in direct implementation of truncated series. The second important reason is that direct method can differentiate the first half part of the data in this form. But in time series analysis forecasting is important and desired. So a new fractional discretization form is proposed and the new ARFIMA (p,d,q) technique is applied on some biostatistical data. Relevant theory, obtained results and comparisons with classical approach is demonstrated throughout the paper. Results support the importance and usefulness of the new method.

**Keywords:** Fractional differencing, ARFIMA, Time Series

**References**

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