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# A novel data partitioning and rule selection technique for modeling high-order fuzzy time series

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## Highlights

- A novel data partitioning scheme is presented.
- FLR for each time lag are established separately and averages of predicted values are taken at the end.
- A new rule selection criterion is adopted.
- It overcomes the difficulty in forecasting when there is no matching rule present in the training data.

## Abstract

Fuzzy time series forecasting is an emergent research topic. In fuzzy time series model design, accuracy of forecast is dependent on two major issues: (1) Efficient data partitioning (2) Establishing Fuzzy logical relationships for Prediction. In this study, a new data partitioning technique based on rough-fuzzy approach has been proposed. Then, for the prediction purpose, a novel rule selection criterion has been adopted. In addition to that a mechanism is devised to deal with the situation when there is no matching rule present in the training data. Motivation for the present work is to overcome the drawback of existing high-order fuzzy time series models by avoiding the computations of complicated fuzzy logical relationship considering all previous states at a time and then explicit matching of those rules. The proposed work produces output of improved accuracy with selective rules only. In this high order model fuzzy logical relationships for each time lag are established separately and predictions are combined at the end to produce final result. Performance of the model is evaluated using TAIEX dataset. This idea also outperforms the some of the recent fuzzy time series forecasting models using the same dataset, in terms of forecast accuracy.

**Keywords:** Forecast, Interval, Membership, Rough Set, Rule

## 1. Introduction

Time series data have a natural sequence and observations are recorded at uniform time intervals. Fuzzy time series is most effective method to model uncertainty. Traditional time series forecasting techniques can not deal with the problems where the values of time series are linguistic terms such as bad, average,

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