



Application of the Sugeno-Takagi-Kang fuzzy logic for demand forecasting in the supply chain, a Fuzzy temporary series forecast model (FTS) proposal.

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Abstract. Forecasting is not an easy task; the time series analysis area has always represented a challenge for those who intend to do it. Resource anticipation and planning have great importance in decision-making, practically in any area of the economy, manufacturing, work, agriculture, tourism, and of course, supply chain sectors. There are many forecasting methods that often require innumerable statistical analyses. However, most of the systems have unreliable information where there is great uncertainty. This is why the application of fuzzy logic in time series forecasting represents a choice to overcome the uncertainty of the supply chain. As a result of this investigation, we found that applying the Sugeno-Takagi-Kang of fuzzy logic method, we have found that this model can obtain better prediction results, especially for data of small sample sizes (>20 records). The paper presents a methodology for incorporating limited or incomplete data into a modified Sugeno-Takagi-Kang model applied in the supply chain area and propose a Fuzzy temporary series forecast model. The model: 1) incorporates the knowledge and experience from the user experts, which allows to enhance the results with qualitative experience than otherwise would be considered, 2) establish the universe of discourse based on the demand behavior and experts' opinion, 3) defines the fuzzifier module, 4) interphase, 5) the knowledge data base. 6) the output functions (f_n) and 7) finally the output forecast. Metric for calculating the forecasting error and evaluating its performance was: mean absolute percentage error (MAPE). The results obtained exceed other models and methodologies such as: seasonal or temporary index or even data mining, which requires a very superior amount of information, obtaining barely better or marginally results, for instance the MAPE with the traditional methods was 30.42% vs. a MAPE of 9.95% by using the proposed model. The results show that the prediction ability of the grey prediction with Fuzzy temporary series forecast model is better than traditional approach, especially if we consider the amount of data available.

Keywords: Fuzzy logic, forecasting, supply chain, Sugeno-Takagi-Kang

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