

**UNIVERSITI TEKNOLOGI MARA**

**FUZZY TIME SERIES  
FORECASTING MODEL BASED ON  
TRAPEZOIDAL FUZZY NUMBERS  
AND SIMILARITY MEASURE  
APPROACH**

**SITI MUSLEHA BINTI AB MUTALIB**

**MSc**

**December 2017**

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Thesis submitted in fulfilment of  
the requirements for the degree of  
**Master of Science**

**Faculty of Computer and Mathematical Sciences**

**December 2017**

## ABSTRACT

Forecasting is important to minimize the uncertainty in decision making. Various forecasting methods have been proposed and one of them is the forecasting model using fuzzy time series (FTS). FTS forecasting model can cater for data in linguistic values. However, most of the FTS forecasting models use discrete fuzzy sets as a basis for calculating the forecasted values and, thus, cannot provide the forecasted range under different degrees of confidence. Besides, in order to calculate the forecasting accuracy such as mean square error (MSE) and mean absolute percentage error (MAPE), the forecasted values need to be defuzzified. During the defuzzification process, some information could be lost from the data due to the simplification process. Hence, this contributes to its inability to grasp the sense of uncertainty that has been kept throughout the forecasting procedure. In this study, we propose an FTS forecasting model based on trapezoidal fuzzy numbers with a similarity measure approach. Three methods of partitioning the intervals are used which are average based length, frequency density based and re-divide randomly chosen length. Furthermore, the order of relation of FTS is also considered which are the first order and the second order relation. The forecasting accuracy is evaluated using degree of similarity between fuzzy actual value and fuzzy forecasted value. A combination of three fuzzy similarity measures namely the centre of gravity, area and height is used to evaluate the forecasting accuracy. For implementation purposes, this proposed model is applied to forecast the unemployment rate in Malaysia from the year 1982 to 2013. The result shows that the interval length and the order of FTS will affect the forecasting accuracy. Moreover, the similarity measure concept can be used as an alternative approach to measure the accuracy without going through the defuzzification process.

## ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and the Most Merciful. Peace and blessing of Allah the all Mighty to our beloved, final Prophet Muhammad S.A.W and his relatives, all his companions and those who have followed. Alhamdulillah, all praise and thankfulness to Allah S.W.T, the Most Glorious and Omnipotent, with His willingness has allowed me to complete this research project.

The completion of this thesis is the result of guidance and support from many special individuals. I would like to express my gratitude to Dr Nazirah binti Ramli, my supervisor, for her guidance, encouragement and comments to develop more knowledge during the period of my research. I appreciate Prof. Dr Daud bin Mohamad for his assistance, support and guidance. With their suggestions and recommendations at every stage of the work has made this research easier. Thanks are also due to my entire family especially my mother for their tremendous encouragement while finishing this thesis. With her blessing, I can overcome any difficulty and achieve the goal. To my late father this success is on the spirit that you gave to me before this. Your spirit is always with me and always inspire my life.

Finally, I would like to express my gratitude to my friends especially who have, together with me, given their support and assistance throughout the completion of this thesis.

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