Universal Non Causal Future Average Of A Time Series Type Sequence

Author: Ramesh Chandra Bagadi, *FIE, CEng(India)*
Affiliation 1: Owner & Co-Director, tex*N* Consulting Private Limited, Hyderabad, Telengana State, India
Email: rameshcbagadi@uwalumni.com
Tel: +91-9440032711

ABSTRACT

In this research investigation, the author has detailed a novel Universal Non Causal Future Average of a Time Series Type Sequence.

INTRODUCTION

A lot of literature is available in the domain of Future Averages. The reader can refer to the types of Future Averages dealt in the subject of Time Series Analysis.

THEORY (AUTHOR'S FUTURE AVERAGE OF A TIME SERIES TYPE SEQUENCE MODEL)

Firstly, we define the definitions of Similarity and Dissimilarity as follows:
Given any two real numbers a and b, their Similarity is given by

$$Similarity(a,b) = \begin{matrix} a^2 \; if \; a < b \\ b^2 \; if \; b < a \end{matrix}$$

and their Dissimilarity is given by

$$Dissimilarity(a,b) = \begin{matrix} ab - a^2 \; if \; a < b \\ ab - b^2 \; if \; b < a \end{matrix}$$

Given any time series or non-time series sequence of the kind

$$S = \{y_1, y_2, y_3, ..., y_{n-1}, y_n\}$$

We can now write the Future Average of the Time Series Type Sequence S, i.e., y_{n+1} as

$y_{(n+1)} = y_{(n+1)S} + y_{(n+1)DS}$ where

$$y_{(n+1)S} = \sum_{i=1}^{n} y_i \left\{ \frac{\left(\sum_{\substack{j=1 \\ j \neq i}}^{n} \left(\frac{Total\ Exhaustive\ Similarity(y_i, y_j)}{Total\ Exhaustive\ Similarity(y_i, y_j) + Total\ Exhaustive\ Dissimilarity(y_i, y_j)} \right) \right)}{\left(\sum_{r=1}^{n} \sum_{\substack{j=1 \\ j \neq r}}^{n} \left(\frac{Total\ Exhaustive\ Similarity(y_r, y_j)}{Total\ Exhaustive\ Similarity(y_r, y_j) + Total\ Exhaustive\ Dissimilarity(y_r, y_j)} \right) \right)} \right\}$$

and

$$y_{(n+1)DS} = \sum_{i=1}^{n} y_i \left\{ \frac{\left(\sum_{\substack{j=1 \\ j \neq i}}^{n} \left(\frac{Total\ Exhaustive\ Dissimilarity(y_i, y_j)}{Total\ Exhaustive\ Similarity(y_i, y_j) + Total\ Exhaustive\ Dissimilarity(y_i, y_j)} \right) \right)}{\left(\sum_{r=1}^{n} \sum_{\substack{j=1 \\ j \neq r}}^{n} \left(\frac{Total\ Exhaustive\ Dissimilarity(y_r, y_j)}{Total\ Exhaustive\ Similarity(y_r, y_j) + Total\ Exhaustive\ Dissimilarity(y_r, y_j)} \right) \right)} \right\}$$

The definitions of Total Exhaustive Similarity and Total Exhaustive Dissimilarity are detailed as follows:

$$Total\ Exhaustive\ Similarity(y_i, y_j) = Similarity(y_i, y_j) + Similarity(S_1, S_2) + Similarity(S_3, S_4) + Similarity(S_4, S_5) + \ldots\ldots + Similarity(S_k, S_{k+1})\ till\ Smaller(S_k, S_{k+1}) = 0$$

for some k

$$where\ S_1 = \{Smaller(y_i, y_j)\}\ and\ S_2 = \{Larger(y_i, y_j) - Smaller(y_i, y_j)\}$$

$$where\ S_3 = \{Smaller(S_1, S_2)\}\ and\ S_4 = \{Larger(S_1, S_2) - Smaller(S_1, S_2)\}$$

$$where\ S_4 = \{Smaller(S_3, S_4)\}\ and\ S_5 = \{Larger(S_3, S_4) - Smaller(S_3, S_4)\}$$

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and so on so forth

$$where\ S_k = \{Smaller(S_{k-1}, S_k)\}\ and\ S_{k+1} = \{Larger(S_{k-1}, S_k) - Smaller(S_{k-1}, S_k)\}$$

Similarly, we write

$$Total\ Exhaustive\ Dissimilarity(y_i, y_j) = Dissimilarity(y_i, y_j) + Dissimilarity(S_1, S_2) + Dissimilarity(S_3, S_4) + Dissimilarity(S_4, S_5) + \ldots\ldots + Dissimilarity(S_k, S_{k+1})\ till\ Smaller(S_l, S_{l+1}) = 0$$

for some l

$$where\ S_1 = \{Smaller(y_i, y_j)\}\ and\ S_2 = \{Larger(y_i, y_j) - Smaller(y_i, y_j)\}$$

$$where\ S_3 = \{Smaller(S_1, S_2)\}\ and\ S_4 = \{Larger(S_1, S_2) - Smaller(S_1, S_2)\}$$

$$where\ S_4 = \{Smaller(S_3, S_4)\}\ and\ S_5 = \{Larger(S_3, S_4) - Smaller(S_3, S_4)\}$$

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and so on so forth

Similarly, we can write the Total Exhaustive Similarity and Total Exhaustive Dissimilarity for (y_r, y_j)

One can note that this notion of Future Average does not induct the Causal Nature of the Time Series Type Of Sequence.

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