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Universal Non Causal Future Average of a Time Series Type Sequence

Ramesh Chandra Bagadi, *FIE, CEng*
Owner & Co-Director, texN Consulting Private Limited, Hyderabad, Telengana State, India

***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

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

and their Dissimilarity is given by

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

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

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

And

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

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

$$\begin{aligned}
&Total\ Exhaustive\ Similarity(y_i,y_j)=\\
&Similarity(y_i,y_j)+Similarity(S_1,S_2)+\\
&Similarity(S_3,S_4)+Similarity(S_4,S_5)+\\
&.......+Similarity(S_k,S_{k+1})\ till\\
&Smaller(S_k,S_{k+1})=0\\
&\ for\ some\ k\\
&where\ S_1=\{Smaller(y_i,y_j)\}\ and\\
&\ S_2=\{L\arg er(y_i,y_j)-Smaller(y_i,y_j)\}\\
&where\ S_3=\{Smaller(S_1,S_2)\}\ and\\
&S_4=\{L\arg er(S_1,S_2)-Smaller(S_1,S_2)\}\\
&where\ S_4=\{Smaller(S_3,S_4)\}\ and\\
&\ S_5=\{L\arg er(S_3,S_4)-Smaller(S_3,S_4)\}\\
&...\\
&...\\
&..\\
&...\\
&and\ so\ on\ so\ forth\\
&where\ S_k=\{Smaller(S_{k-1},S_k)\}\ and\\
&S_{k+1}=\{L\arg er(S_{k-1},S_k)-Smaller(S_{k-1},S_k)\}
\end{aligned}$$

Similarly, we write

$$
\begin{aligned}
&Total\ Exhaustive\ Dissimilarity\left(y_i, y_j\right)= \\
&Dissimilarity\left(y_i, y_j\right)+Dissimilarity\left(S_1, S_2\right)+ \\
&Dissimilarity\left(S_3, S_4\right)+Dissimilarity\left(S_4, S_5\right)+ \\
&.......+Dissimilarity\left(S_k, S_{k+1}\right)\ till \\
&Smaller\left(S_l, S_{l+1}\right)=0 \\
&for\ some\ l \\
&where\ S_1=\left\{Smaller\left(y_i, y_j\right)\right\}\ and \\
&S_2=\left\{L\arg er\left(y_i, y_j\right)-Smaller\left(y_i, y_j\right)\right\} \\
&where\ S_3=\left\{Smaller\left(S_1, S_2\right)\right\}\ and \\
&S_4=\left\{L\arg er\left(S_1, S_2\right)-Smaller\left(S_1, S_2\right)\right\} \\
&where\ S_4=\left\{Smaller\left(S_3, S_4\right)\right\}\ and \\
&S_5=\left\{L\arg er\left(S_3, S_4\right)-Smaller\left(S_3, S_4\right)\right\} \\
&... \\
&.. \\
&... \\
&.. \\
&and\ so\ on\ so\ forth
\end{aligned}
$$

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

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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