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The Recursive Future Equation Based On The Ananda-Damayanthi Normalized Similarity Measure. {File Closing Version 4}. ISSN 1751-3030

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Technical Note

Abstract

In this research Technical Note the author have presented a Recursive Future Average Of A Time Series Data Based on Cosine Similarity.

Theory

The Recursive Future Average Of A Time Series Data Based on Cosine Similarity can be given by the following methods:

Method 1:

$$y_{n+1} = \frac{\sum_{i=1}^{n} (y_i)\{CS(y_i, y_{n+1})\}}{\left\{\sum_{i=1}^{n} \left(\{CS(y_i, y_{n+1})\}^2\right)\right\}^{1/2}}$$

where $CS(y_i, y_{n+1}) = \left\{\frac{Smaller\ \ of\ \ (y_i, y_{n+1})}{Larger\ \ of\ \ (y_i, y_{n+1})}\right\}$

when the Time Series Data is of the kind

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

Method 2:

$$y_{n+1} = \frac{\sum_{i=1}^{n} (y_i)\{CS(y_i, y_{n+1})\}\{CS(y_i, y_{n+1})\}}{\sum_{i=1}^{n} \{CS(y_i, y_{n+1})\}}$$

where $CS(y_i, y_{n+1}) = \left\{\frac{Smaller\ \ of\ \ (y_i, y_{n+1})}{Larger\ \ of\ \ (y_i, y_{n+1})}\right\}$

when the Time Series Data is of the kind

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

Deriving motivation from this concept [2], we further extend this formula using [1] as

$$y_{n+1} = \frac{\left\{ \begin{array}{l} \sum_{i=1}^{n}(y_i)\{CS(y_i, y_{n+1})\} + \sum_{i=1}^{n}({}^1y_i)\{CS({}^1y_i, y_{n+1})\} + \sum_{i=1}^{n}({}^2y_i)\{CS({}^2y_i, y_{n+1})\} + \ldots\ldots + \\ \sum_{i=1}^{n}({}^ry_i)\{CS({}^ry_i, y_{n+1})\} \end{array} \right\}}{\left\{ \begin{array}{l} \sum_{i=1}^{n}\left(\{CS(y_i, y_{n+1})\}^2\right) + \sum_{i=1}^{n}\left(\{CS({}^1y_i, y_{n+1})\}^2\right) + \sum_{i=1}^{n}\left(\{CS({}^2y_i, y_{n+1})\}^2\right) + \ldots\ldots + \\ \sum_{i=1}^{n}\left(\{CS({}^ry_i, y_{n+1})\}^2\right) \end{array} \right\}^{1/2}}$$

where $^1y_i = \dfrac{\left\{y_i y_{n+1} - (Smaller\ of\ (y_i, y_{n+1}))^2\right\}}{y_{n+1}}$ and

Model 1:

$$^2y_i = \frac{\left\{{}^1y_i y_{n+1} - (Smaller\ of\ ({}^1y_i, y_{n+1}))^2\right\}}{y_{n+1}}$$, ……, i.e., and so on, so forth

$$^ky_i = \frac{\left\{{}^{k-1}y_i y_{n+1} - (Smaller\ of\ ({}^{k-1}y_i, y_{n+1}))^2\right\}}{y_{n+1}}$$

upto

$$^ry_i = \frac{\left\{{}^{r-1}y_i y_{n+1} - (Smaller\ of\ ({}^{r-1}y_i, y_{n+1}))^2\right\}}{y_{n+1}}$$ such that we can write

$$y_{n+1} = \frac{\left\{\sum_{i=1}^{n}\left\{(y_i)\{CS(y_i, y_{n+1})\} + \sum_{k=1}^{r}({}^ky_i)\{CS({}^ky_i, y_{n+1})\}\right\}\right\}}{\left\{\sum_{i=1}^{n}\left\{\{CS(y_i, y_{n+1})\}^2 + \sum_{k=1}^{r}\{CS({}^ky_i, y_{n+1})\}^2\right\}\right\}^{1/2}}$$

where r is a number such that $^ry_i \to 0$.

Model 2:

where $^1y_i = \{Larger(y_{n+1}, y_i) - Smaller(y_{n+1}, y_i)\}$ and

${}^{2}y_i = \{Larger(y_{n+1}, {}^{1}y_i) - Smaller(y_{n+1}, {}^{1}y_i)\}$, ……, i.e., and so on, so forth

${}^{k}y_i = \{Larger(y_{n+1}, {}^{k-1}y_i) - Smaller(y_{n+1}, {}^{k-1}y_i)\}$

upto

${}^{r}y_i = \{Larger(y_{n+1}, {}^{r-1}y_i) - Smaller(y_{n+1}, {}^{r-1}y_i)\}$ such that we can write

$$y_{n+1} = \frac{\left\{\sum_{i=1}^{n}\left\{(y_i)\{CS(y_i, y_{n+1})\} + \sum_{k=1}^{r}\left({}^{k}y_i\right)\left\{CS\left({}^{k}y_i, y_{n+1}\right)\right\}\right\}\right\}}{\left\{\sum_{i=1}^{n}\left\{\{CS(y_i, y_{n+1})\}^2 + \sum_{k=1}^{r}\left\{CS\left({}^{k}y_i, y_{n+1}\right)\right\}^2\right\}\right\}^{1/2}}$$

where r is a number such that ${}^{r}y_i \to 0$.

Model 3:

where ${}^{1}y_i = Larger\,\frac{\{y_i y_{n+1} - (Smaller\ of\ (y_i, y_{n+1}))^2\}}{Larger\ of\ (y_i, y_{n+1})}$ and

${}^{2}y_i = \frac{\{{}^{1}y_i y_{n+1} - (Smaller\ of\ ({}^{1}y_i, y_{n+1}))^2\}}{Larger\ of\ ({}^{1}y_i, y_{n+1})}$, ……, i.e., and so on, so forth

${}^{k}y_i = \frac{\{{}^{k-1}y_i y_{n+1} - (Smaller\ of\ ({}^{k-1}y_i, y_{n+1}))^2\}}{Larger\ of\ ({}^{k-1}y_i, y_{n+1})}$

upto

${}^{r}y_i = \frac{\{{}^{r-1}y_i y_{n+1} - (Smaller\ of\ ({}^{r-1}y_i, y_{n+1}))^2\}}{Larger\ of\ ({}^{r-1}y_i, y_{n+1})}$ such that we can write

$$y_{n+1} = \frac{\left\{\sum_{i=1}^{n}\left\{(y_i)\{CS(y_i, y_{n+1})\} + \sum_{k=1}^{r}\left({}^{k}y_i\right)\left\{CS\left({}^{k}y_i, y_{n+1}\right)\right\}\right\}\right\}}{\left\{\sum_{i=1}^{n}\left\{\{CS(y_i, y_{n+1})\}^2 + \sum_{k=1}^{r}\left\{CS\left({}^{k}y_i, y_{n+1}\right)\right\}^2\right\}\right\}^{1/2}}$$

where r is a number such that ${}^{r}y_i \to 0$.

References

1.Bagadi, R. (2016). Proof Of As To Why The Euclidean Inner Product Is A Good Measure Of Similarity Of Two Vectors. *PHILICA.COM Article number 626*.
http://philica.com/display_article.php?article_id=626
2.Bagadi, R. (2017). Recursive Future Average Of A Time Series Data Based On Cosine Similarity. ISSN 1751-3030. *PHILICA.COM Article number 1075*.
http://philica.com/display_article.php?article_id=1075
3.http://www.philica.com/advancedsearch.php?author=12897
4.http://www.vixra.org/author/ramesh_chandra_bagadi