One Step Forecasting Model {Advanced Model} Version 5

ISSN 1751-3030

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Abstract

In this research investigation, the author has presented an Advanced Forecasting Model.

Theory

Given,

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

$$Y_{\{(k+1)\mapsto n\},\{1\mapsto k\}} = \left\{ \overbrace{y_{k+1}, y_{k+2}, \ldots\ldots, y_{n-1}, y_n}^{\{(k+1)\mapsto n\}}, \overbrace{y_1, y_2, y_3, \ldots.. y_k}^{\{1\mapsto k\}} \right\}$$

Now, $y_{k+1}, y_{k+2}, \ldots\ldots, y_{n-1}, y_n$ can be arranged among themselves (within their position bounds) in $(n-k)!$ ways and $y_1, y_2, y_3, \ldots.. y_k$ can be arranged among themselves (within their position bounds) in $k!$ ways. Hence, the Vector $Y_{\{(k+1)\mapsto n\},\{1\mapsto k\}}$ can be arranged in $\{(n-k)! \times k!\}$ number of ways.

$${}^{j}Y_{\{(k+1)\mapsto n\},\{1\mapsto k\}} = j^{th}\ arrangement\ of\ \ elements\ of\ \ Y_{\{(k+1)\mapsto n\},\{1\mapsto k\}}\ \ among\ the\{(n-k)! \times k!\}arrangements$$

$$Y_{\{n\mapsto((k+1))\},\{1\mapsto k\}} = \left\{ \overbrace{y_n, y_{n-1}, \ldots\ldots, y_{k+2}, y_{k+1}}^{\{n\mapsto((k+1))\},\{1\mapsto k\}}, \overbrace{y_1, y_2, y_3, \ldots.. y_k}^{\{1\mapsto k\}} \right\}$$

$$\hat{Y}_{\{n\mapsto((k+1))\},\{1\mapsto k\}} = \frac{\left\{ \overbrace{y_n, y_{n-1}, \ldots\ldots, y_{k+2}, y_{k+1}}^{\{n\mapsto((k+1))\},\{1\mapsto k\}}, \overbrace{y_1, y_2, y_3, \ldots.. y_k}^{\{1\mapsto k\}} \right\}}{\left\{ \sum_{i=1}^{n} y_i^2 \right\}^{1/2}}$$

$$\hat{Y}_n = \frac{\{y_1, y_2, y_3, \ldots\ldots, y_{n-1}, y_n\}}{\left\{\sum_{i=1}^{n} y_i^2\right\}^{1/2}}$$

$${}^{j}\hat{Y}_{1,(n-k)} = \frac{{}^{j}Y_{\{(k+1)\mapsto n\},\{1\mapsto k\}}}{\left\{\sum_{i=1}^{n} y_i^2\right\}^{1/2}}$$

$$Co\sin eSimilarity\left(\hat{Y}_n,\ {}^{j}\hat{Y}_{\{(k+1)\mapsto n\},\{1\mapsto k\}}\right) = Dot\Pr oduct\left(\hat{Y}_n,\ {}^{j}\hat{Y}_{\{(k+1)\mapsto n\},\{1\mapsto k\}}\right)$$

$$Co\sin eSimilarity\left(\hat{Y}_n,\ {}^{j}\hat{Y}_{\{n\mapsto((k+1))\},\{1\mapsto k\}}\right) = Dot\Pr oduct\left(\hat{Y}_n,\ {}^{j}\hat{Y}_{\{n\mapsto((k+1))\},\{1\mapsto k\}}\right)$$

Computation of ${}^{j}\alpha_{n-k}$

$${}^{j}\alpha_{n-k} = Co\sin eSimilarity\left(\hat{Y}_n,\ {}^{j}\hat{Y}_{\{(k+1)\mapsto n\},\{1\mapsto k\}}\right)$$

Model 1

For finding y_{n+1}

$$y_{n+1} = \frac{\sum_{k=0}^{n-1} \sum_{j=1}^{\{(n-k)!\times k!\}} \left({}^{j}\alpha_{n-k}\right)\left(y_{k+1}\right)}{\left\{\sum_{k=0}^{(n-1)} \sum_{j=1} \left\{{}^{j}\alpha_{n-k}\right\}^2\right\}^{1/2}}$$

Model 2

For finding y_{n+1}

$$y_{n+1} = \frac{\sum_{k=0}^{n-1} \sum_{j=1}^{\{(n-k)!\times k!\}} \left({}^{j}\alpha_{n-k}\right)\left(y_{n-k}\right)}{\left\{\sum_{k=0}^{(n-1)} \sum_{j=1} \left\{{}^{j}\alpha_{n-k}\right\}^2\right\}^{1/2}}$$

References

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