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One Step Forecasting Model {Advanced Model}

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Abstract

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

Theory

Given,

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

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

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

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

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

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

Model

$$y_{n+1} = \sum_{k=0}^{n-1} \left(\breve{\breve{\alpha}}_{n-k}\right)\left(y_{n-k}\right)$$

Case 1:

$$^{j}\alpha_{n-k} = \frac{Cosine Similarity\left(\hat{Y}_{n},\ {}^{j}\hat{Y}_{\{(k+1)\mapsto n\},\{1\mapsto k\}}\right)}{\left\{\sum_{k=0}^{n-1}\left\{Cosine Similarity\left(\hat{Y}_{n},\ {}^{j}\hat{Y}_{\{(k+1)\mapsto n\},\{1\mapsto k\}}\right)\right\}^{2}\right\}^{1/2}}$$

Case 2:

$$^{j}\alpha_{n-k} = \frac{Cosine Similarity\left(\hat{Y}_{n},\ {}^{j}\hat{Y}_{\{(k+1)\mapsto n\},\{1\mapsto k\}}\right)}{\sum_{k=0}^{n-1}\left\{Cosine Similarity\left(\hat{Y}_{n},\ {}^{j}\hat{Y}_{\{(k+1)\mapsto n\},\{1\mapsto k\}}\right)\right\}}$$

Computation of $\breve{\alpha}_{n-k}$

Case 1:

$$\breve{\alpha}_{n-k} = \sum_{j=1}^{(n-k)!}\left\{\frac{{}^{j}\alpha_{n-k}}{\sum_{j=1}^{(n-k)!}{}^{j}\alpha_{n-k}}\right\}{}^{j}\alpha_{n-k}$$ **Self-Weighted Mean**

Case 2:

$$\breve{\alpha}_{n-k} = \sum_{j=1}^{(n-k)!}\left\{\frac{{}^{j}\alpha_{n-k}}{\left\{\sum_{j=1}^{(n-k)!}\left\{{}^{j}\alpha_{n-k}\right\}^{2}\right\}^{1/2}}\right\}{}^{j}\alpha_{n-k}$$ **Normalized Weight**

Computation of $\breve{\breve{\alpha}}_{n-k}$

Case 1:

$$\breve{\breve{\alpha}}_{n-k} = \left\{\frac{\breve{\alpha}_{n-k}}{\sum_{k=0}^{n-1}\breve{\alpha}_{n-k}}\right\}$$

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Case 2:

$$\breve{\breve{\alpha}}_{n-k} = \frac{\breve{\alpha}_{n-k}}{\left\{ \sum_{k=0}^{n-1} \left\{ \breve{\alpha}_{n-k} \right\}^2 \right\}^{1/2}}$$

References

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