One Step Forecasting Model

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Abstract

In this research investigation, the author has presented two models of One Step Forecasting.

Theory

Given,

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

$$Y_{(k+1),n} = \{y_k, y_{k+1}, y_{k+2}, \ldots\ldots, y_{n-1}, y_n\}$$

$$Y_{1,(n-k)} = \{y_1, y_2, y_3, \ldots\ldots, y_{n-k-1}, y_{n-k}\}$$

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

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

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

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

Model 1

$$y_{n+1} = \sum_{k=0}^{n-1} (\alpha_{n-k})(y_{n-k})$$

$$\alpha_{n-k} = \frac{Co\sin eSimilarity\left(\hat{Y}_{(k+1),n}, \hat{Y}_{1,(n-k)}\right)}{\left\{\sum_{k=0}^{n-1}\left\{Co\sin eSimilarity\left(\hat{Y}_{(k+1),n}, \hat{Y}_{1,(n-k)}\right)\right\}^2\right\}^{1/2}}$$

Model 2

$$y_{n+1} = \sum_{k=0}^{n-1}(\alpha_{n-k})(y_{n-k})$$

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

Note:

CosineSimilarity of only two different numbers can be taken as

1. Zero, i.e., 0
2. Ratio of the Smaller Number by the Larger Number

Results

Model 1

For Model 1, when the first 8 Primes Numbers, i.e., $Y_n = \{2,3,5,7,11,13,17,19\}$ were taken to predict the next Number, a result of 22.8606 was found. The next Prime Number being 23, the Error % was (23-22.8606)

$$Error\ \% = \left\{\frac{(23 - 22.8606)}{23}\right\} \times 100 = 0.606087\%$$

References

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2. http://www.philica.com/advancedsearch.php?author=12897