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Temperature Prediction from Time Series

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Abstract—The Kanban cell neuron stock trading system (KCNSTS), US patent pending, was applied to the given time series. The maximum daily temperature was the fiducial measure of profitability. The variable assignment was by logical cluster band for a 2-tuple as $\langle 11, 10, 01, 00 \rangle$. The logical formula was the linear expression of (maximum temperature AND minimum temperature) OR rainfall. The mean temperature per day was the basis for prediction. Both buy-side and sell-side algorithms were evaluated. When a trading signal was indicated, the mean temperature of that date was applied to the next calendar date as the temperature value predicted. The observed value was the mean temperature of the next day to be predicted, and the expected value was the prediction from the previous day on which the signal was indicated. Prediction analysis for the respective 2822 days in the series was based on the previous 68-days of data as a moving window of 68-days backward in time. KCNSTS did not predict the temperature for every day in September, 2014, but for only the two days on 2014/09/21 and 2014/09/06. For 1-Step-ahead, KCNSTS predicted 327 dates. For 326 degrees of freedom, the mean squared error (MSE) for 1-Step-ahead was 4.06. For 5-Step-ahead, KCNSTS predicted 214 dates. For 213 degrees of freedom, the mean squared error (MSE) for 5-Step-ahead was 12.33. Therefore KCNSTS predicted 1-Step-ahead at a more significant level than for 5-Step-ahead.

Keywords—*competition; mean squared error; prediction; temperature; time series*

I. INTRODUCTION

The contest goal was to predict temperature extrema for September 1 to 21, 2014 from the time series supplied for 2007 to 2014. The increments were for 1-Step-ahead and for 5-Step-ahead.

The series contained extrema temperatures and total rainfall. A few dates contained no rainfall statistics, and this analysis consequently excluded those to evaluate 2822 dates. The mean daily temperature was also derived for each date.

II. BACKGROUND

The Kanban cell neuron stock trading system (KCNSTS) [1], US patent pending, was applied to the time series. The maximum daily temperature was the fiducial measure of profitability. The variable assignment was by logical cluster band for a 2-tuple as $\langle 11, 10, 01, 00 \rangle$. The logical formula was the linear expression of (maximum temperature AND

minimum temperature) OR rainfall. The mean temperature per day was the basis for prediction. Both buy-side and sell-side algorithms were evaluated. When a trading signal was indicated, the mean temperature of that date was applied to the next calendar date as the temperature value predicted. The observed value was the mean temperature of the next day to be predicted, and the expected value was the prediction from the previous day on which the signal was indicated.

Each prediction analysis for the respective 2822 days in the series was based on the previous 68-days of data. Therefore the date prediction used a moving window of 68-days backward in time. Other extents for a historical time window were not evaluated. This was because the arbitrary 68-days was generally deemed in the financial sector as a sufficient default range for making predictions.

III. HARDWARE

The processing on a two core laptop took about 110-minutes including I/O of about 110K files in 1 GB of disk space.

IV. OPTIMIZATION

Modification of the forward looking rules engine to improve the statistical performance was not undertaken because the KCNSTS software used is identical to that for trading signal analysis.

V. RESULTS

KCNSTS did not predict the temperature for every day in September, 2014. For example it predicted only the two days on 2014/09/21 and 2014/09/06.

KCNSTS rejected 2495 out of 2822 dates or about 88% of the time series. For 1-Step-ahead, KCNSTS predicted 327 dates. For 326 degrees of freedom, the mean squared error (MSE) for 1-Step-ahead was 4.06 as collated in [2]

For 1-Step-ahead, Fig. 1 shows the respective variance of observed and predicted mean temperatures by dates predicted and the MSE. The source code in TrueBASIC with data statements to derive Fig. 1 is in [4].

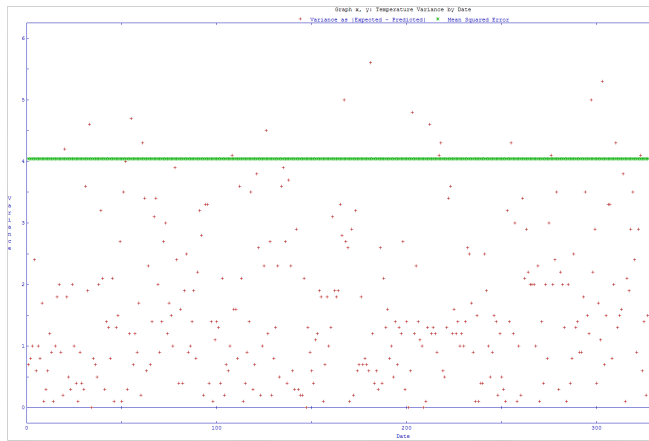


Figure 1. Variance of mean temperatures by dates predicted and MSE

For 5-Step-ahead, KCNSTS predicted 214 dates. For 213 degrees of freedom, the MSE for 5-Step-ahead was 12.33 as collated in [3].

VI. CONCLUSION

KCNSTS predicted 1-Step-ahead with MSE of 4.1 at a more significant level than for 5-Step-ahead with MSE of 12.3.

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