

Temporal autocorrelation of the temperature in Key West, Florida during the 20th century

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Abstract

Temperature displays an autocorrelation effect, whereby successive years have more similar temperatures than more distant years.

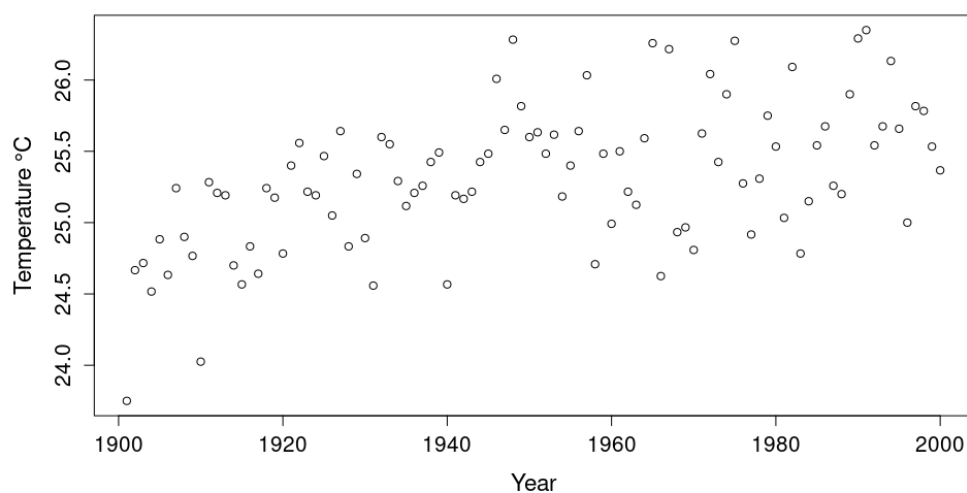


Figure 1: Teperature in Key West, Flordia during the 20th century.

1 Materials & Methods

Temperature data is from Key West, Florida and collected between 1901 and 2000 (Fig. 1).

Autocorrelation is computed by calculating the correlation between successive years (t and $t-1$). A significance value (p-value) is obtained by comparing the correlation of the temperature data ordered by year, to correlation between temperature data that has been randomly permuted ($n = 10,000$; Fig. 2)). Correlation coefficients of the permuted data are calculated by comparing successive values. The significance value is taken as the number of times the correlation of permuted data is greater than the correlation of ordered data, divided by the number of iterations (10,000).

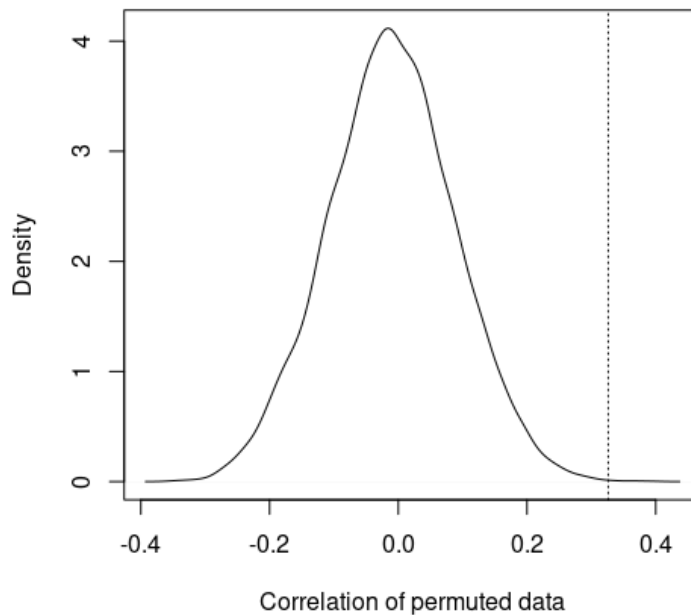


Figure 2: Density plot of the correlations between successive values of randomly permuted temperature data ($n = 10,000$). The dotted line indicates the correlation between successive years of the ordered temperature data (0.326).

2 Results

The correlation between successive years (0.326) returns a p-value of less than 0.001 (Fig.2). The observed correlation occurs in fewer than 10 in 10,000 iterations of the randomly permuted data.

3 Discussion

The results suggest that temperature displays a significant autocorrelative effect between successive years. The relationship between successive years displays a moderate correlation. Therefore, the temperature of any year is predicted to have a significant effect on the temperature of the following year, however, other factors will contribute to the observed variation in the data.