Autocorrelation in Weather

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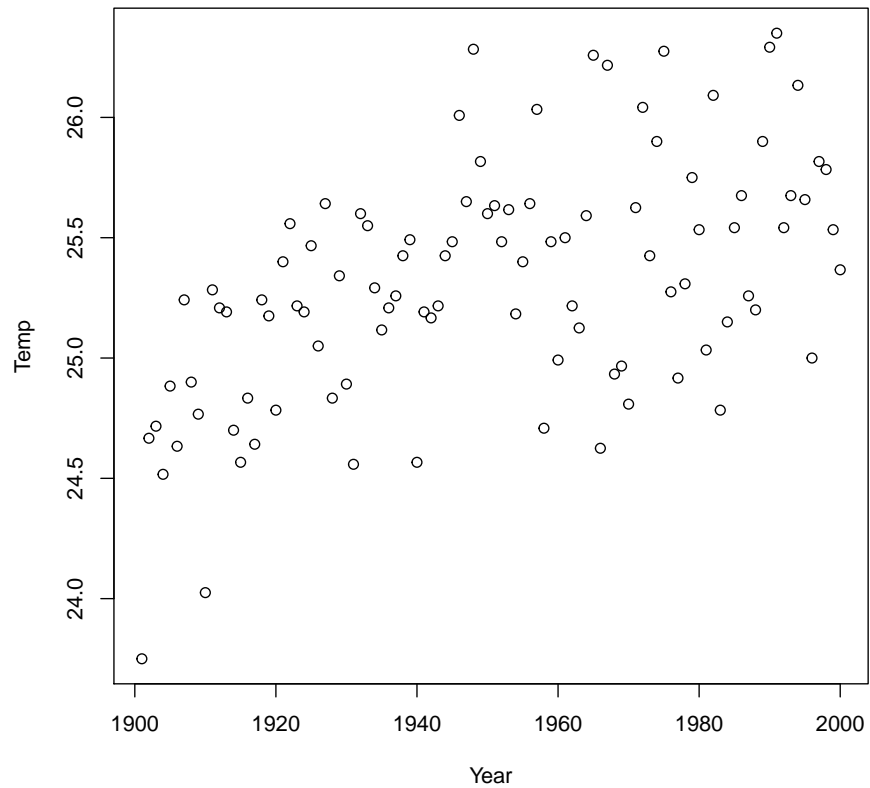
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Abstract

Temperatures of one year are significantly correlated with the next year.

1 Materials & Methods

```
load("../Data/KeyWestAnnualMeanTemperature.Rdata")
attach(ats)
plot(ats)
```

```r
#calculate the successive correlation
r_successive = cor(Temp[1:99],Temp[2:100])

# calculate the random permutation correlation
set.seed(001)
r_random = rep(NA, 10000)
for (i in 1:length(r_random))
{
  random_yearTemp = sample(Temp, length(Year), replace = FALSE)
  r_random[i] = cor(random_yearTemp[1:99],random_yearTemp[2:100])
}

p_position=0
for (i in 1:length(r_random))
{
  if (r_successive<r_random[i])
```
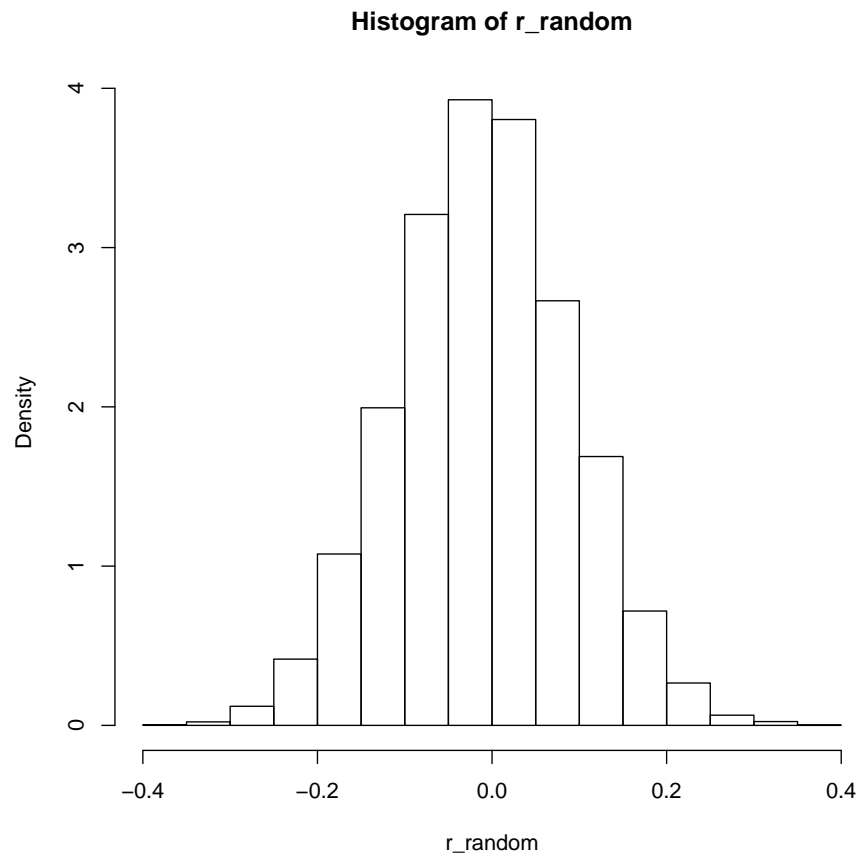
```
  {
    p_position = p_position+1
  }
}
p_value = p_position/length(r_random)

hist_correlation=hist(r_random, probability = T)
```

Histogram of r_random


```
print (p_value)

## [1] 4e-04
```

$$p_value = 4e - 4 \tag{1}$$

2   Conclusion

The possibility that temperatures of one year are significantly correlated with the next year is 99.96 of one hundred percent, thus temperatures of one year and next year have significant correlation.