

Question: Autocorrelation in weather

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Hypothesis: Annual temperature ($^{\circ}\text{C}$) is influenced by the previous year.

1 Load KeyWestAnnualMeanTemperature.Rdata

```
> load("../Data/KeyWestAnnualMeanTemperature.Rdata");ls()
```

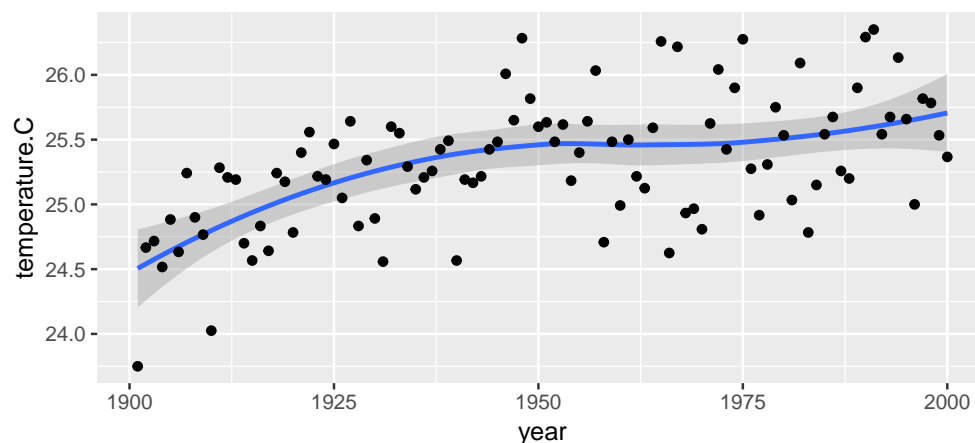
```
[1] "ats"
```

2 Examine correlation coefficient of data

```
> print(b<-unlist(cor(ats,method = "spearman"))[1,2])
```

```
[1] 0.5255559
```

3 Plot data



Annual temperature of Key West, Florida for the 20th century

4 Sample Spearman correlation 10K times through random time-series perturbation

```
> dm<-1e4
> a<-rep(NA,dm);i<-1
> for(x in sample((2:dim(ats)[1]),dm,replace = T)){
+   ## random pick 10K sample from years range (1901-2000)
+   a[i]<-unlist(cor(ats[(1:x),],method = "spearman"))[1,2]
+   i<-i+1}
```

With Spearman correlation coefficient mean (from sampling) calculated as:

```
> mean(a)
[1] 0.5355228
```

5 Fraction of sampling > overall coefficient (approx. p.val)

```
> length(a[which(a>b)]) / length(a)
[1] 0.4887
```

6 Discussion

Correlation coefficient from both overall (Sec.2) and sampled (Sec.4) were only in medium levels. The approximated p-value (Sec.5) is falsifying the hypothesis ($p > 0.05$).

The results showed that time (i.e. year) is not a statistically-significant factor for the annual temperature for Florida in the twentieth century. Hence the “best-fitted” curve in the plot (Sec.3) was a mis-interpretation. Other factors (including but not limited to atmospheric carbon dioxide levels, atmospheric sulphur dioxide levels and suspended particulates level) should also be considered in future analyses.