Time Series Analysis

Lecture 2

Regression With Time Series, An Introduction to Exploratory Time Series Data Analysis and Time Series Smoothing

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Linear Time Trend Regression

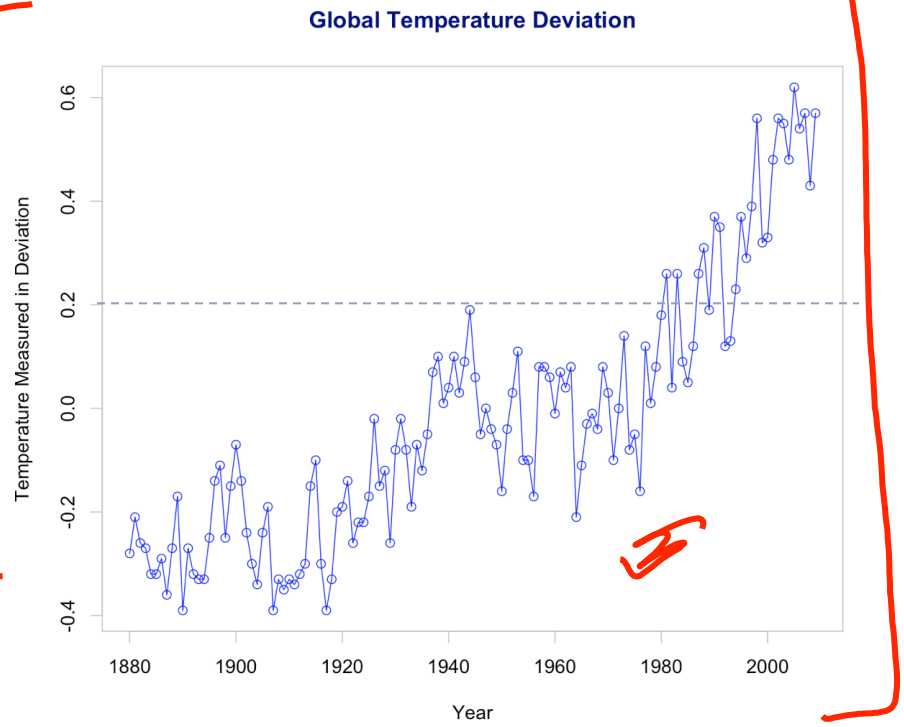
Linear Time Trend Regression

- Use the global temperature (measured in deviation) data for illustration.
- Always a good idea to look at the structure of the data after loading the data.

```
> str(gtemp)
 Time-Series [1:130] from 1880 to 2009: -0.28 -0.21 -0.26 -0.27 -0.32 -0.32 -0.29 -0
 36 -0.27 -0.17 ...
```

```
# Visualize the series
plot(gtemp, type="o", col="blue", fg=16,
     main="Global Temperature Deviation", col.main="Navy",
     xlab="Year",
     ylab="Temperature Measured in Deviation")
```

- Although the (deviation) series fluctuates from year to year, it exhibits an upward trend starting in around 1920, and the temperature has an annual increase of at least 0.2 degree per year since around the mid-1990s.



Use a Linear Time Trend Regression to Model the Global Temperature (Deviation) Series

Consider the following linear time trend regression model:

$$y_t = \beta_0 + \beta_1 t + \epsilon_t$$

where t in this case takes values in the following set $1880, \ldots, 2009$ and ϵ_t is an $i.i.d.$ normal sequence. Note that this assumption needs to be checked later on.

Note that we can shift the time index to $1, 2, \ldots, 130$ and not affect the interpretation of the slope coefficient β_1; it only affects the intecept β_0.

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