

W271-2 – Spring 2016 – HW 5

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Exercises

Question 1

1. Install the library "astsa" using the function: `install.packages("astsa")`

```
# Check if already installed; if not, install it
if (!"astsa" %in% installed.packages()[, "Package"]) install.packages("astsa")
```

2. Load the library: `library(astsa)`

```
# Load the library: library(astsa)
library(astsa)
# Last two commands can be substituted by simply...
if (!require(astsa)) install.packages("astsa")
```

3. Use the function `str()` to see the information of a particular data series, such as `str(EQ5)` for the Seismic Trace of Earthquake number 5 series

```
str(EQ5)
```

```
## Time-Series [1:2048] from 1 to 2048: 0.01749 0.01139 0.01512 0.01477 0.00651 ...
```

```
str(flu)
```

```
## Time-Series [1:132] from 1968 to 1979: 0.811 0.446 0.342 0.277 0.248 ...
```

```
str(gas)
```

```
## Time-Series [1:545] from 2000 to 2010: 70.6 71 68.5 65.1 67.9 ...
```

According to that [package documentation](#), EQ5 corresponds to the *Seismic trace of an earthquake [two phases or arrivals along the surface, the primary wave ($t = 1, \dots, 1024$) and the shear wave ($t = 1025, \dots, 2048$)] recorded at a seismic station.*

4. Plot the time series plots and histograms of the following 3 series. Feel free to use the codes provided in the R scripts. Make sure that each of your graph has a title, the axis ticks are clear, the axes are well-labelled, and use color intelligently.

```
## Time-Series [1:2048] from 1 to 2048: 0.01749 0.01139 0.01512 0.01477 0.00651 ...
```

```
## Time-Series [1:132] from 1968 to 1979: 0.811 0.446 0.342 0.277 0.248 ...
```

```
## Time-Series [1:545] from 2000 to 2010: 70.6 71 68.5 65.1 67.9 ...
```

5. Write a few sentences to describe each of the series.

- EQ5

...

- flu

...

- gas

...

Question 2

Describe 3 examples you have used in your work or encounter in real life. Ideally, you can even load at least one of these time series, plot it, and then write a few statements to describe its characteristics.

Question 3

Simulate a white noise series with 1000 random draws and plot (1) a time series plot and (2) a histogram. The usual requirements on graphics (described) in Question 1) applied.

Question 4

Simulate (with 1000 random draws) the following two zero-mean autoregressive model with order 1 (i.e. AR(1)) models:

$$y_t = 0.9y_{t-1} + w$$

$$y_t = 0.2y_{t-1} + w$$

Plot a time plot for each of the simulated series. Graph a histogram for each of the simulated series. Write a few statements to compare the two series.

Question 5

Simulate (with 1000 random draws) the following 3 models:

1. A deterministic linear (time) trend of the form: $y_t = 10 + 0.5t$
2. Random walk without drift
3. Random walk with drift = 0.5

Plot a time plot for each of the simulated series. Graph a histogram for each of the simulated series. Write a few statements to compare the two series.
