

STA 4853

Homework # 2

Due Wednesday, February 28, 2024

(submit by uploading a single pdf to Canvas)

Organize your homework following [homework_guidelines.pdf](#).

Problems 1–6:

The data set `hw2p1_data.txt` contains 6 time series of length $n = 101$ which should be named Z1 to Z6. Each series was generated by one of the following six processes: random shocks ($z_t = a_t$), AR(1), AR(2), MA(1), MA(2), ARMA(1,1). Use *only* the sample ACF and PACF and the “Autocorrelation Check for White Noise” to determine the correct generating process for each of the series. **All of these output items should be supplied with your homework**, along with a clear statement of your answer and (at least) one complete sentence carefully justifying your answer. Important numbers or parts of plots that influenced your decision should be circled or highlighted in the output, with accompanying written (or typed) comments. Each series constitutes a separate problem; Problem #1 analyzes series Z1, Problem #2 analyzes series Z2, etc. Each of the six processes is used exactly once, but this fact should not form part of the written justification of your choices.

Problems 7–11:

The data set `hw2p2_data.txt` contains 5 time series of length $n = 200$ which should be named Z7 to Z11. One of these is a realization from a stationary process and the others are realizations from *non*-stationary processes. For each series, select **exactly one** of the following descriptions for the underlying process. Each choice is used exactly once, but this fact should not form part of the written justification for your answers.

- (a) Strictly stationary.
- (b) Does **not** have a constant mean.
- (c) Does **not** have a constant variance (but does have a constant mean).
- (d) Does **not** have a constant ACF (but does have a constant mean and variance).
- (e) Is weakly stationary, but **not** strictly stationary. (See note below.)

Supply the time series plot for each series, and any additional output which directly supports the answer you choose for each series. Clearly state your answer, and give (at least) one complete sentence carefully justifying your answer. All output should be annotated with written (or typed) comments explaining how it supports your answer. (If you include some output, you **must** state how it supports your answer.) Each series constitutes a separate problem; Problem #7 analyzes series Z7, Problem #8 analyzes series Z8, etc.

Note: A process which is weakly stationary, but **not** strictly stationary changes its behavior **in some way** over time, but **does** have a constant mean, variance, and autocorrelation function (i.e., these do not change with time).