

IMPORTANT NOTES. Please upload your homework to Canvas or email your homework to our TA: ys688 at stat.rutgers.edu. For the simulation and data analysis problems, please put the code you developed at the end of the homework report (no separated files).

1. Suppose that the daily log return of a security follows the model

$$r_t = 0.01 + 0.6r_{t-1} - 0.4r_{t-2} + a_t,$$

where $\{a_t\}$ is a white noise series with mean zero and variance 0.02.

- (a) What is the mean of the return series r_t ?
- (b) Compute the lag-1, lag-2 and lag-3 autocorrelations of r_t .
- (c) Simulate a time series of length $T = 2000$ from this model. Create a time series plot, and a sample autocorrelation plot. Compute the lag-1, lag-2 and lag-3 sample autocorrelations.
- (d) (Bonus 5 pts). Compute the variance, lag-1 and lag-2 autocovariances of r_t . What are the corresponding sample autocovariances?

2. Suppose we have the following estimates from the data:

$$\hat{\mu} = 0.5768, \hat{\gamma}_0 = 1.7379, \hat{\gamma}_1 = 1.4458, \hat{\gamma}_2 = 1.0600.$$

Find the Yule-Walker estimates for the AR(2) model.