Assignment #2: Time Plots, Filters, Covariance, and Stationarity

STA 5362: Time Series Analysis

Fall Semester

1. SS #1.7
2. SS #1.9. You will need the following trigonometric identity.
$$\cos(A - B) = \sin A \sin B + \cos A \cos B.$$
3. SS #1.12
4. SS #1.13
5. Use the natural logarithm of the `varve` time series from the `astcs` package. Does the `acf()` function in R use the same formula that was given in class? Demonstrate your answer. For reference
$$\hat{\rho}(h) = \frac{\hat{\gamma}(h)}{\hat{\gamma}(0)}, \quad \text{for } h = 0, 1, 2, \ldots, H,$$
where
$$\hat{\gamma}(h) = \frac{1}{n} \sum_{t=1}^{n-h} (x_{t+h} - \bar{x})(x_t - \bar{x}).$$
6. Plot the sample ACF of each of the time series from homework #1 and comment on what you see for each one. Do *NOT* transform any of the series. Comment on the appropriateness of using sample ACF on the data. Find the argument in the `acf` function that allows you to extend the number of lags plotted, and increase the number of lags as needed.
   (a) Monthly totals, in thousands, of the number of international airline passengers from 1949 to 1960. Plot at least four years of lags.
   (b) The daily "percent_full" for the reservoirs in Texas. Plot at least 10 years of lags.
   (c) Daily closing stock price of Amazon and the Daily Amazon stock market returns. Comment on the difference in the sample ACF plots of these two time series. You may need to make a time plot of one of these two series, if you haven't done so on assignment #1.