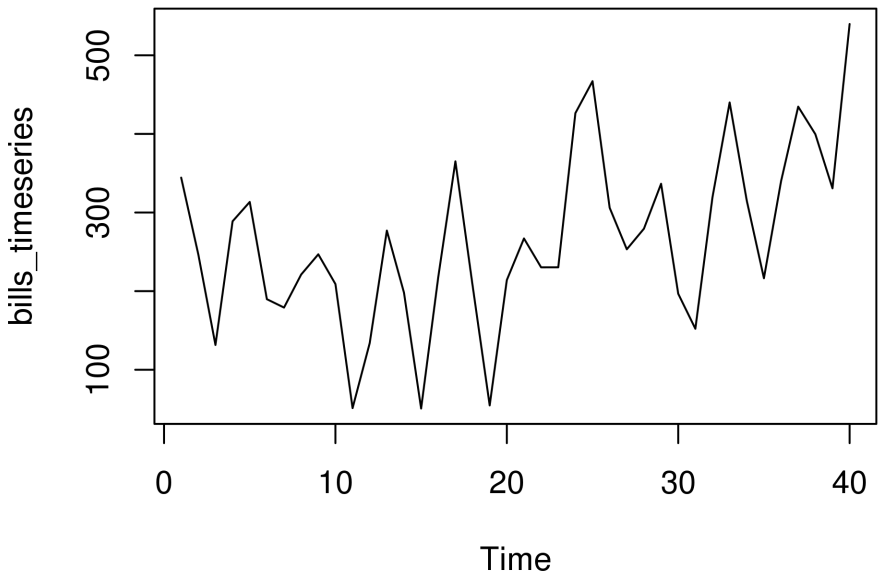
Homework Assignment 10

Matthew Tiger

November 18, 2015

Problem 1. Plot the energy bills versus time. What kind of trend appears to exist? What type of seasonal variation appears to exist? Is a transformation needed to obtain a series that displays constant variation?

Solution. See below for a plot of the bills time series data:



It is clear from the plot that there is a trend that appears to move upwards as time increases and a seasonal variation with period 4 lags present in the data so a transformation is needed to obtain residuals that represent a stationary time series. □

Problem 2. Write algebraically a time series model with trend and seasonal component with definitions of the dummy variable.

Solution. Note that it appears that this time series has a quadratic trend. Additionally, we are interested in capturing the seasonal quarter data of the time series. Therefore, a time series model for the data with trend and seasonal components is given by

$$X_t = a_0 + a_1 t + a_2 t^2 + a_3 Q_1 + a_4 Q_2 + a_5 Q_3 + a_6 Q_4,$$

where we define Q_i as 1 if $t \equiv i \mod 4$ and 0 otherwise and a_j is constant. □