This assignment is on heteroscedasticity and autocorrelation problems. The necessary data come from two sources: the Excel files hprice_1.xls and traffic_2.xls available at http://u.arizona.edu/~rlo/ under econ 522a. Be sure to use matrix commands and attach the supporting computer print out to the completed assignment and make clear where your answers are shown.

1. Consider the following model of residential property assessments based on the hprice_1 data set containing a random sample of 88 homes:

   \[ \text{assess}_t = \beta_0 + \beta_1 \text{sqrft}_t + \beta_2 (\text{sqrft}_t)^2 + \beta_3 \text{bdrms}_t + \beta_4 \text{lotsize}_t + \beta_5 (\text{lotsize}_t)^2 + u_t, \]

   where \( t = 1, \ldots, 88 \)

   where \(\text{assess}\) is assessed value in $1,000s, \(\text{sqrft}\) is the size of house in square feet, \(\text{bdrms}\) is the number of bedrooms, and \(\text{lotsize}\) is the size of the lot in square feet. You may assume that \(u_t\) is serially uncorrelated, follows a normal distribution, and is independent of the regressors.

   a. Compute the White heteroscedasticity consistent (robust) variance/covariance matrix for the OLS estimator of the model's coefficients.

   Suppose a researcher suspects that \(\text{var}(u_t) = h(Z_t)\),

   where \(Z_t = \alpha_0 + \alpha_1 \text{sqrft}_t + \alpha_2 (\text{sqrft}_t)^2 + \alpha_3 \text{bdrms}_t + \alpha_4 \text{lotsize}_t + \alpha_5 (\text{lotsize}_t)^2\).

   b. Use a LM test to test for homoscedasticity at the 5% level of significance.

   c. Assume that \(\text{var}(u_t) = \exp(Z_t)\)

   (1) Use FGLS to estimate the parameters of the assessment model.

   (2) Use the F test as an asymptotic test for homoscedasticity at the 5% level of significance.

   d. If it were true that \(\text{var}(u_t) = \exp(Z_t)\), compare and contrast the statistical properties of OLS using the White correction procedure with those of the FGLS estimator of the assessment model.
2. Consider the following model of traffic accidents based on the traffic_data set that contains monthly time series data for the State of California over the period 1981-89:

\[ \text{totacc}_t = \beta_0 + \beta_1 \text{feb}_t + \beta_2 \text{mar}_t + \beta_3 \text{apr}_t + \beta_4 \text{may}_t + \beta_5 \text{jun}_t + \beta_6 \text{jul}_t + \beta_7 \text{aug}_t \\
+ \beta_8 \text{sep}_t + \beta_9 \text{oct}_t + \beta_{10} \text{nov}_t + \beta_{11} \text{dec}_t + \beta_{12} \text{spdlaw}_t + \beta_{13} \text{beltlaw}_t + \beta_{14} \text{time}_t + u_t, \]

where the variables of interest for this exercise are total number of statewide automobile accidents, \(\text{feb}_t - \text{dec}_t\) (dummy variables for each month), \(\text{spdlaw}\) (dummy variable = 1 for each month after the 65 mph speed limit took effect), \(\text{beltlaw}\) (dummy variable = 1 for each month after the seatbelt law took effect), and \(\text{time}\) (linear time trend for each month starting with 1 and ending in 108). Assume that the error term is a normally distributed random variable with mean zero and constant variance and is independent of the regressors.

\[ u_t = u_{t-1} + \varepsilon_t, \] where \(\varepsilon_t\) satisfies all of the standard assumptions and \(|\rho| < 1\). Use any appropriate test to test \(H_0: \rho = 0, H_1: \rho \neq 0\) at the 5% level of significance. What can you conclude about the properties of OLS applied to the traffic accident model?

b. Assume \(\rho \neq 0\), and use both the iterated Prais-Winsten and Cochrane-Orcutt FGLS procedures to estimate the traffic model.

3. Now consider the following alternative model of traffic accidents:

\[ \text{totacc}_t = \beta_0 + \beta_1 \text{feb}_t + \beta_2 \text{mar}_t + \beta_3 \text{apr}_t + \beta_4 \text{may}_t + \beta_5 \text{jun}_t + \beta_6 \text{jul}_t + \beta_7 \text{aug}_t \\
+ \beta_8 \text{sep}_t + \beta_9 \text{oct}_t + \beta_{10} \text{nov}_t + \beta_{11} \text{dec}_t + \beta_{12} \text{spdlaw}_t + \beta_{13} \text{beltlaw}_t \\
+ \beta_{14} \text{time}_t + \beta_{15} \text{totacc}_{t-1} + u_t, \ t = 2, \ldots, 108. \]

Assume that the error term is a normally distributed random variable with mean zero and constant variance.

a. Suppose one suspects that \(u_t = \rho u_{t-1} + \varepsilon_t\), where \(\varepsilon_t\) satisfies all of the standard assumptions and \(|\rho| < 1\). Use an appropriate method to test \(H_0: \rho = 0, H_1: \rho \neq 0\) at the 5% level of significance. What can you conclude about the properties of OLS applied to the alternative traffic accident model?

b. What do your results for the alternative model suggest about the source of the serial correlation in the original model in question 2? Explain.

c. What do your results for the alternative model suggest about the properties of the FGLS estimators of the original model in question 2? Explain.