1. Suppose from a regression on 74 observations of a dependent variable on a constant and one independent variable, the SSR = 8.916

   If the sample is divided into the first 30 observations and the last 24 observations and the same model is estimated on each subsample to get $SSR_1 = 1.215$ and $SSR_2 = 3.4895$

   Carry out a test, to determine if there is heteroscedasticity in the model.

   What is the Null Hypothesis?
   What are the test statistic and its distribution?
   Test at the 1% level.
   What is the critical value?
   What is the decision?

2. How does Heteroscedasticity affect the least square estimator and forecasts?

3. Suppose the error variance of a model is describe by the equation

   $$\sigma_t^2 = \alpha_0 + \alpha_1 Z_1 + \alpha_2 Z_2 + \varepsilon_t$$

   Describe how to use Feasible Generalized Least Squares to get efficient estimates of the coefficients of the model.

4. When two are more independent variables are correlated with one another the value of the R^2 will be low . True or False

5. You estimate a model with 3 variables. You then add a fourth, the value of R^2 increase by a small amount, the new estimated coefficient is statistically significant, the other coefficients change substantially and all their standard errors increase substantially.
   What is likely taking place?

6. Suppose you are given the following information:

Model 1 $\quad \ln Y_t = 4.99 + 23.2D_1 + 36.5D_2 + .732 \ln X_1 - 2.798\, D_1 \ln X_1 + 4.251\, D_2 \ln X_1 - .371 \ln X_2 + .405\, D_1 \ln X_2 - .236\, D_2 \ln X_2$ $\quad$ adjusted $R^2 = .921$, $\quad SSR = .018645$

Model 2 $\quad \ln Y_t = 4.18 + .103D_1 + .103D_2 + .621 \ln X_1 - .201 \ln X_2$

adjusted $R^2 = .852$, SSR = .04195

Where n = 29 $D_1 = 1$ for observations 12 to 20, (period 2) and 0 otherwise.
$D_2 = 1$ for observations 21 to 29, (period 3) and 0 otherwise

(a) What are the elasticities of Y with respect to X_1 and X_2 in period 1, 2, and 3

(c) How can one test the Null Hypothesis that there has been no structural change in the elasticities of Y with respect to X_1 and X_2 over the three time periods, observations 1 – 11, 12 – 20, and 21 – 29?

Write out the null and alternative hypotheses in term of the *B*'s.
Calculate the test statistic, and its distribution.
Carry out the test and the 1% level.
What is the result?

7. Consider

$$\hat{Y}_t = \underset{(3)}{34} + \underset{(6)}{28}\,X_t \qquad n = 40 \quad d = 3.2$$

With 1 independent variable and 40 observations at 5%, $d_L = 1.44$ $d_U = 1.54$. Is the error term first order autocorrelated at the 5% level?
What type (if any) autocorrelation is there?

8. Consider the model

$$Y_t = B_0 + B_1X_1 + B_2X_2 + u_t \quad \text{with 30 observations.}$$

Where it is possible that u_t depends on, u_{t-1} and u_{t-2} and a random error term.

Describe how to carry out an LM test at the 5% level to determine if there is second degree autocorrelation.

9. Describe the Cochrane-Orcutt Iterative procedure to correct for first order autocorrelation in the model

$$Y_t = B_0 + B_1X_1 + B_2X_2 + u_t$$

10. Consider a 3rd degree Autoregressive Conditional Heteroscedastic Model where

$$\sigma_t^2 = \alpha_0 + \alpha_1 u^2_{t-1} + \alpha_2 u^2_{t-2} + \alpha_3 u^2_{t-3} + \varepsilon_t$$

Explain how to carry out an ARCH test for this heteroscedasticity.

(i) What is the null hypothesis?

(ii) What is the auxiliary equations?

(iii) What is the test statistic, its distribution and degrees of freedom?
(iv) What is the decision rule?

11. You want to estimate a model of a production function.

$Q_t = B_0 + B_1 L_t + B_2 K_t + u_t$

Where L_t = Dollar amount of Labour employed in period t.
and K_t = Dollar amount of Capital employed in period t.

The firm's budget is such that the firm always spends $80,000 on Capital and Labour each period.

a) Is Multicollinearity a problem?
b) Can the equation be estimated using per period data?

12. Suppose we wish to test the null hypothesis that a coefficient is equal to zero vs. the alternative that it is not zero at the 5 % level. If the 95% confidence interval for the coefficient does not contain zero, then we will reject the null hypothesis. Explain.

13. Suppose we perform an F test and reject the null hypothesis and all the coefficients except the constant are zero. Does this imply the regression is a good fit for the data. Explain.

14. Suppose $\hat{Y}_t = .9857 + .1266\, X_1 - .088 X_2 + .7329\, Y_{t-1}$
(.336) (.0565) (.052) (.1102) (standard errors)

$R^2 = .9958$ $n = 44$ $d = 1.11$ $\rho = .445$

Test the Null Hypothesis that there is no first order autocorrelation at the 5% level.
(note: with 3 independent variables and 44 observations $d_L = 1.48$ and $d_U = 1.58$ at 5%)