1. Why does the rank condition for identification imply satisfaction of the order condition? Why doesn’t satisfaction of the order condition imply satisfaction of the rank condition?

2. Consider the model,

\[ q_d^i = \alpha_0 + \alpha_1 p_t + \alpha_2 y_t + e_t \]
\[ q_s^i = \beta_0 + \beta_1 p_t + \beta_3 z_t + u_t \]
\[ q_d^i = q_s^i \]

where \( p_t \) is endogenous and \( y_t \) and \( z_t \) are exogenous. Suggest how to test

\[ H_0 : \alpha_2 = \beta_3 = 0 \]
\[ H_A : \alpha_2 \neq 0, \beta_3 \neq 0. \]

3. Let

\[ y = X \beta + u, \]

where \( X \) is a matrix of explanatory variables, some of which may be endogenous. Let \( Z \) be a matrix of instruments for \( X \). Define

\[ \hat{\beta} = (X'X)^{-1} X'y, \]
\[ \tilde{\beta} = (Z'X)^{-1} Z'y. \]

a) Show that both estimators are consistent.
b) Show that

\[ D \left[ \sqrt{T} \left( \hat{\beta} - \beta \right) \right] - D \left[ \sqrt{T} \left( \tilde{\beta} - \beta \right) \right] \geq 0. \]

4. a) Gather data on inflation, unemployment rates, and at least two other variables that you think affect the relationship between inflation and the unemployment rate. Also gather data on at least two instruments to control for the endogeneity of the unemployment rate. Use a sample period from 1950 to 2000.
b) Estimate a Phillips curve where inflation is the dependent variable using 2SLS.
c) Derive the asymptotic covariance matrix of the difference between an OLS estimator and your 2SLS estimator.