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MSc Econometrics (Ec402)
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Problem Set #6

Instructions: To be discussed in week 8.

1. .

   (a) Explain what we mean by the "Normal Linear Regression Model (NLRM)". Outline the conditions that characterize this model. Repeat with the term "Asymptotic Linear Regression Model (ANLRM)".

   (b) Based on the NLRM, discuss which quantities will be distributed as $\chi^2(\cdot)$ and which as $F(\cdot,\cdot)$.

   (c) Will the same two distributions be relevant for the case of the ANLRM?

2. In the multivariate regression model $y = X\beta + \epsilon$ with $k = 5$ regressors, explain how you would perform a test of the hypothesis:

$$H_0: \begin{array}{c} \beta_1 \cdot \beta_2 = 1 \\ \beta_3 = 4\beta_4 - 2 \end{array}$$

   using the statistic:

$$Q = g(\hat{\beta})' \left(g_\beta(\hat{\beta}) \hat{V}(\hat{\beta}) g_\beta(\hat{\beta})' \right)^{-1} g(\hat{\beta})$$

   Which of the classic linear regression assumptions does your test need? Explain whether your test procedure is asymptotic or is appropriate for any finite sample size.

3. Consider the classic linear regression model, where A1+A2+A3Rmi hold.

   Reminder: $A1 : rank(X) = k$, $A2 : y = X\beta^{true} + \epsilon^{true}$ with $E(\epsilon^{true}) = 0$, and $A3Rmi : E(\epsilon^{true}|X) = \epsilon^{true}$.

   It is also believed that: $A4 : E(\epsilon^{true}\epsilon^{true\prime}|X) = c^2\Omega(\lambda)$.

   (a) Define the IGLS estimator for β^{true} for the case that the λ parameter vector is known, and the FGLS estimator for β^{true} for the case that λ is unknown but a preliminary estimator $\hat{\lambda}$ for it is available.

   (b) Derive the sampling error vectors for IGLS and FGLS.

   (c) Use the sampling error vectors from (b) to explain the major differences in the properties of the two estimators.