

# Econ 772 Homework 2 Linear Model

1) Let

$$y = X\beta + u,$$

and consider the restriction

$$R\beta = c.$$

Write down an unbiased estimate of  $\beta$  that satisfies the restriction and derive its asymptotic distribution. Show that its asymptotic covariance matrix is smaller than the asymptotic covariance matrix of the OLS estimator.

2) Consider the model

$$y_i = \sum_{j=1}^m \beta_j x_{ij} + u_i$$

where there is no constant in the equation. Derive the properties of  $R^2$  for this model.

3) Let

$$\begin{aligned} y &= X\beta + u, \\ \hat{y} &= X\hat{\beta}, \\ \hat{u} &= y - \hat{y}. \end{aligned}$$

Find the asymptotic distribution of

- $\hat{u}'\hat{u}/n$ ;
- $\hat{u}'\hat{y}/n$ ;
- $\hat{u}'u/n$ .