Quiz 1 solution
Econometrics II Spring, 2013

When the estimator $\overline{\theta}_{2n}$ is the constrained MLE, show that the Neyman $C(\alpha)$ test coincides with the score test.

Solution:

$$C(\alpha) = \frac{1}{n}[\frac{\partial Ln(\overline{\theta}_n)}{\partial \theta_1} - I_{12}(\overline{\theta}_n) I_{22}^{-1}(\overline{\theta}_n) \frac{\partial Ln(\overline{\theta}_n)}{\partial \theta_2}]' I^{11}(\overline{\theta}_n)[\frac{\partial Ln(\overline{\theta}_n)}{\partial \theta_1} - I_{12}(\overline{\theta}_n) I_{22}^{-1}(\overline{\theta}_n) \frac{\partial Ln(\overline{\theta}_n)}{\partial \theta_2}]$$

Note that, when $\overline{\theta}_{2n}$ is the constrained MLE, $\frac{\partial Ln(\overline{\theta}_n)}{\partial \theta_2} = 0$. Thus,

$$C(\alpha) = \frac{1}{n}[\frac{\partial Ln(\overline{\theta}_n)}{\partial \theta_1}]' I^{11}(\overline{\theta}_n)[\frac{\partial Ln(\overline{\theta}_n)}{\partial \theta_1}]$$

which is of the form of score test.