**Likelihood Ration test**

Suppose that a researcher wanted to test the null hypothesis that for some restriction (e.g., ). Explain how this might be achieved within the maximum likelihood framework.

Since the model was estimated using maximum likelihood, it does not seem natural to test this restriction using the F-test via comparisons of residual sums of squares (and a t-test cannot be used since it is a test involving more than one coefficient). Thus we should use one of the approaches to hypothesis testing based on the principles of maximum likelihood (Wald, Lagrange Multiplier, Likelihood Ratio). The easiest one to use would be the likelihood ratio test, which would be computed as follows:

1. Estimate the unrestricted model and obtain the maximised value of the log-likelihood function.
2. Impose the restriction by rearranging the model, and estimate the restricted model, again obtaining the value of the likelihood at the new optimum. Note that this value of the LLF will be likely to be lower than the unconstrained maximum.
3. Then form the likelihood ratio test statistic given by

LR = -2(Lr - Lu) ~ χ2(m)

where Lr and Lu are the values of the LLF for the restricted and unrestricted models respectively, and m denotes the number of restrictions, which in this case is one.

1. If the value of the test statistic is greater than the critical value, reject the null hypothesis that the restrictions are valid.