Econometrics I
Fall 2000
Assignment 10

Today's Date: December 6
Due Date: December 12

Please show all of your work and clearly indicate your final response to each question. Attach all GAUSS programs you use in completing the exercises.

1. Ruud 18.1
2. Ruud 18.6
3. Ruud 18.13
4. For this problem you are to use the data set Ec1_wag (one last time!). Consider estimation of the following linear model

\[ \ln(w) = X\beta + \epsilon; \]

with \( E(\epsilon | X) = 0 \); The columns of \( X \) include a vector of 1's; the schooling dummy variables HS_Dip and More_HS; Age; and the indicator variable Male:

(a) Estimate the model under the assumption that \( E(\epsilon | X) = \sigma I_N \); Compute the OLS point estimates and an unbiased estimate of the standard errors of the estimates.

(b) After making the additional assumption (beyond that made in part a) that the \( \epsilon \) are normally distributed, test whether males have significantly higher mean wages than females (this is a one-sided test).

(c) Instead of assuming that the errors are homoskedastic, assume that

\[
E(\epsilon | X) = \begin{bmatrix}
2 & 3 \\
\frac{1}{2} & 0 & \cdots & 0 \\
\frac{1}{4} & 0 & \cdots & 0 \\
0 & \cdots & 0 & \frac{1}{4} \\
\end{bmatrix}
\]

Compute the consistent estimates of the standard errors of the OLS estimates in this case. Conduct the same test you conducted in part b and comment on any differences in your results. To which set of results do you give more credibility?
(d) Now make a functional form assumption regarding the heteroskedasticity in the population. Assume that for all males the variance of \( y \) is \( \sigma_m^2 \), while for all females the conditional variance of the disturbance is \( \sigma_f^2 \): Form a feasible GLS estimator of \( \theta \) in this case and perform an asymptotically valid test of the hypothesis that \( \theta_{\text{male}} > 0 \): Interpret your test results and compare them to the earlier ones you have performed.

(e) Assume that for males the distribution of \( y \) is \( \text{N}(0; \sigma_m^2) \), while for females the distribution of \( y \) is \( \text{N}(0; \sigma_f^2) \): Are your feasible GLS estimates from part (d) the same as maximum likelihood estimates under these distributional assumptions? If not, obtain the ML estimates of the model, and perform the one-sided hypothesis test that \( \theta_{\text{male}} > 0 \):