Homework 6. Due Wednesday March 5.

1. (30% of the 2024 Econometrics II final. The same question was asked in the first midterm.)
Assume you are estimating the model

$$Y_i = aX_i + u_i \ ,$$

by OLS. Here a is a scalar and we assume for simplicity that there is no intercept and that in the true underlying model (not censured or truncated) the error term has mean 0.
Assume that you only have 2 observations: $X' = (1, 2)$, $Y' = (2, 5)$.
The OLS estimate $\hat{a}$ is 2.4 and the residuals are 0.4 and –0.2 (they do not sum to zero because we have no constant).
a) (10%) Calculate the White robust standard error for $\hat{a}$.
b) (10%) Now assume that the two observations above form a group and we have a second group where (for computational simplicity) we also assume $X' = (1, 2)$, $Y' = (2, 5)$. So your data are now $X' = (1, 2, 1, 2)$, $Y' = (2, 5, 2, 5)$. $\hat{a}$ is still 2.4 and the residuals as before (repeated).
b) (20%) Calculate the Robust standard error if you cluster on the two groups.

2. Computer question (continuation of previous homeworks). In Matlab, regress real per capita U.S. data consumption growth on income growth and the interest rate using the posted dataset. (This is the what you did in homework 1.)

a) Calculate the residuals, take the absolute value, and regress them on each of the regressors. Do you find evidence of heteroskedasticity? (Use t-tests.)
b) An alternative "test:" plot the residuals against each of the regressors. Do the residuals look homoskedastic?
c) Assume that you are told that the variance of the residuals is proportional to the square of the interest rates. Estimate the relation using the efficient GLS estimator.
d) Program up and estimate the standard errors using the White robust estimator.