Module 2 Discussion Reply

1. OLS estimators discussion:
   a. I think that I understand what you are saying in the reply to part a. I kind of understand the implication of having homoscedasticity in the data, since otherwise we would have an issue such as the variance increasing as x increases, which leads to some "fanning out" appearance when the data is plotted. I think having such data is important for certain properties, such as the OLS estimators being the best linear unbiased estimators (BLUE).

   The difference for me comes in how the question is interpreted. I read it as asking whether or not it's possible for us to calculate the OLS estimators given that the data is heteroscedastic. I tried to show that the formula for the OLS estimators is simply based on optimizing some objective function for the parameters β_0 and β_1. In this sense, it's possible to calculate the OLS estimators, but they won't necessarily be the ideal estimators to use if the data is for example heteroscedastic. I am not sure that this approach is correct either, but I think it depends on how to properly interpret the question itself.

   b. I am not sure that I understand your reply in part b. The way that I responded is largely based on my response to part a. So, if my part a is incorrect I am not too sure on how to best reply to part b.

   Looking through your reply, I agree with what is said initially regarding the parameters being biased. That is, you specify the condition for unbiasedness, which I did as well in my response. It seems to me then that you go into the unbiased estimator, $\hat{\sigma}^2$. I think you then state that since this value is based on the estimates which are based on samples of data, it will vary depending on the sample of data. This is an interesting interpretation of constant variance, and I am not sure if it is correct. Although, I think it is a good response.

   My thinking for this problem instead is based on my reply to part a. In part a, I try to show that constant variance is not a requirement of the data in order to construct the OLS estimators. In part b, I try to show also that without constant variance, the OLS estimators constructed in part a are also unbiased. My basis for this reply is that in the derivation of the unbiasedness of each of the OLS estimators, in no section does it necessarily require that there is constant variance. However, I am not sure whether my derivation is correct, nor whether it is a logical statement to make.