Computer Exercise 2 Solutions

1. If there are more children, families may not be able to afford their education. For birth order, it could be that older children are given priority for higher education, and families may hit budget constraints and may not be able to afford as much education for children born later.

2. The p-value from the Wald test is very close to 0. Hence we can say *sibs* and *brthord* are jointly correlated with *educ*.

3. The p-value from the Hausman specification test is around 0.027, which implies education is endogenous and the OLS estimator would be biased.

4. The J-statistic for overidentification test (NR^2 from regressing the 2SLS residuals on all exogenous variables) is around 0.196 which is smaller than the critical value 3.841. It implies that the IVs we use are valid.

5. All the coefficients' estimates are the same. Just the standard errors are different.

6. `btsvc` is the variance matrix of $\hat{\beta}_{2sls}$ calculated under homoskedasticity. It is the same as `vcov(ivres)` and differs from `vcov(tsres2)` only by a factor becasue the estimated residuals in `tsres2` are different from the original model and hence $\widehat{\sigma^2}$ is different. The reason why `vcov(tsres)` is different should also be due to the different estimate of σ^2.

7. `btsvc2` is calculated by accouting for heteroskedasticity.

8. There are some differences between the two estimates. Since `btsls2` takes account of heteroskedasticity, the weighting matrix should be closer to the optimal one if heteroskedasticity is the case. We can check heteroskedasticity by performing a Breucsch-Pagan test, which rejects the null of homoskedasticity. Therefore `btsls2` should be more efficient asymptotically.