

Final 2020 – Brief Answer Key

- 1) See section 3.2.1 for an explanation of why estimators are considered to be random variables. For what makes OLS “good” – see section 4.6.2, and 3.2.3 – 3.2.5 for a description of unbiasedness, efficiency, and consistency.
- 2) The formula for the sample covariance between X and Y looks very similar to the numerator of the equation for b_1 . If the covariance is 0, then the numerator of b_1 is also 0. Intuitively, if the correlation between two variables is exactly 0, then the effect of one on the other is also 0, and b_1 should be 0 as well.
- 3) See section 6.4.1.
- 4) This has been emphasized extensively. See 3.3 for an example.
- 5) See section 6.5.
- 6) The R^2 is high, and we should fail to reject the null. A naïve look at this model might suggest that deaths cause marriages. Remember that correlation does not imply causation. Although there is no statistical evidence to reject the claim that deaths on fishing boats causes the number of marriages, the model is ridiculous and should not be considered in the first place. It is easy to find two variables that are correlated if you look, that doesn’t mean one causes the other.
- 7) a) Divide 12.63 by 0.79. Look up the p-value on the provided standard normal table.
b) You should reject.
c) See section 6.5.1.
d) Same as part (a).
e) You should fail to reject.
f) See section 6.2.
g) IQ may cause different levels of education (e.g. smarter people obtain more education), and may also cause wages (e.g. smarter people make more money). In the first model, *Education* was only indicating that the individual has higher *IQ*, which (according to this data) is the real reason for the increase in wage.
- 8) a) $\$1.21 - \$0.76 = \$0.45$ more.
b) Compare the R^2 from model (1) and (3) in the F-statistic formula (see section 7.4, equation 7.5).
c) Use model (1) as the unrestricted model, and (2) as the restricted model, in equation 7.5.
d) See the last section of Lab 5, see Lab 6, see Review Question 3 part (d) from Chapter 8, or see section 8.2 for examples on how to do this.
e) $R^2 = 1 - \text{RSS}/\text{TSS}$, so $\text{RSS}/\text{TSS} = 1 - R^2$. Plug RSS/TSS into equation 6.4 (in section 6.5.2). $k = 6$.