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Intro Statistics – March 8th, 2021

Exam 2

Question 1:

1. Does a father’s years of schooling significantly predict the son’s years of schooling?
2. Y = betazero + betaone\*x
   1. Y = predicted years of son’s schooling
   2. Betazero – our intercept (starting point of number of years of schooling)
   3. Betaone\*x = slope – how much we expect a one unit increase in years of father’s schooling to change the predicted years of son’s schooling
3. betaone = cov(x,y)/var(x)
   1. 10.21429/(sd(x))^2
   2. betaone = 0.793
   3. betazero = y-mean – betaone\*x-mean
      1. 14.38 – 0.793(12.5)
      2. betazero = 4.468
4. p(x,y) = cov(x,y)/sd(x) \* sd(y)
   1. 10.21429/(3.59 \*3.29)
   2. p(x,y) = 0.865
5. r^2 = (0.865)^2
   1. 74.8% of the variation in Y can be explained by X

Question 2:

1. Y-hat = 2X1 – 1
2. The slopes will be the same: both betaone’s (X1) have the coefficient 2. However, they both have different intercepts. Because it is capturing partial effects (i.e., no interaction terms) the partial effects of betaone depend exclusively on its corresponding coefficient.
3. Y-hat = 2X1 +2 AND Y-hat = 4X1 -1
4. The slopes of the two lines are different (2 as compared to 4). This example contains the interaction term X1X2. In the first case, the fact that the slope didn’t change implies that there is no interaction effect between the two explanatory variables because betathree, in this case, = 0. The second example when betathree =/= 0 shows that X1 depends in some way on X2.

Bonus

1. a\* = 10Y – 0.1X
2. b\* = (10Y – a\*)/0.1(X)