# Test 3 Rubric

#### Stat 21

#### Spring 2022

## 12)

0 - no credit

2 - Minimal answer that does not demonstrate an understanding of the different modeling techniques

4 - Minimal answer referencing relevant equations but not recalling much else from class with regards to these two different modeling techniques

6 - Thorough explanation that demonstrates some understanding of the different modeling techniques but not without any errors or incorrect statements/conclusions

8 - Well-reasoned/explained answer that demonstrates an understanding of the different modeling techniques and when to use them

main idea that most students had: since the predictors have opposite direction and different magnitude correlation with Y, putting them into a model together decreased the r-squared overall. I think this is correct… kind of the opposite of seeing weakly individually correlated predictors/response pairs but overall MLR with strong fit

possibly related ideas: mediation, suppression, simpson's paradox

consider

(all conclude not contradictory)

8 -

7 - got the gist but discussion points to definitions rather than thinking about the information from the modeling techniques overall, no incorrect statements or implications but somewhat vague or missing important details

6 - mostly valid/correct explanation of the phenomena (e.g. missing other important variables, non-linear terms may need to be included, strong correlation does not imply strong linear relationship could have influential points or non-linear relationship) but emphasized the wrong thing(s), e.g. mistakenly pointing to opposite signs as reason for decrease in r-squared or interaction effect as necessary

5 makes no conclusion

<= 4 (concludes is contradictory)

Ideal answer

* difference between correlation and r-squared
  + linear relationships individually, differing in strength/magnitude
  + not very predictive/descriptive together
* not contradictory but interesting to investigate
  + beta coefficients signs and standard errors
  + matrix of scatterplots

0 - no credit

2 - Minimal answer that does not demonstrate an understanding of the different modeling techniques

3 - displays clear understanding of the differences between correlation and coefficient of determination

2- displays some understanding of the differences between correlation and coefficient of determination but not without mistakes

3 - displays understanding as to what may be the cause behind these seemingly contradictory analyses

2 - Answer is complete except it does not provide any explanation as to what may be the cause behind these seemingly contradictory analyses

2 - Answer incorrectly hypothesizes as to what may be the cause behind these seemingly contradictory analyses

2 - no major conceptual misunderstandings

1 - Answer demonstrates or implies minor misunderstandings

## 11)

3 pts – (a) full (including those who thought constant effects means no interaction) - all necessary conditions discussed appropriately

2 pts – (a) partial (no clear understanding of constant effects or other assumptions) - f

1 pt - (a) partial, didn't fully discuss all assumptions necessary

3 pts – (b) full

2 pts – (b) partial

2 pts – (c) full

1 pt – (c) partial

## 10)

For each (a)-(c):

1 pt – valid model

1 pt – valid question

1 pt – clear/correct mathematical notation in H0

## 9)

0 - no credit

2 - credit for attempt

3 - partial credit for demonstrating some understanding of use of interaction terms but not without mistakes

4 - full credit

## 8)

0 - no credit

2 - credit for attempt

4 - partial for demonstrating some understanding of differences among group means, group effects, and reg coefficients

6 - full

## 7)

(a) worth 1.5 points

(b) worth 1.5 points (1 pt if gave mean not level name)

## 6)

0 - no credit

2 - partial for not choosing cook's d but still interpreting meaning of leverage or studres somewhat correctly

2 - Partial credit for choosing cook's d but providing invalid justification

3 - full

## 5) a benefit of studentized; two reasons for transformation; use bootstrap

0 - no credit

1 - credit for attempt

2 - partial for reasoning that demonstrates some understanding but answer contains some mistakes or omissions

3 - Partial credit for reasoning that demonstrates some understanding but answer is partly unclear (one student mentioned "reduced variability")

4 - full

## 4) 0-5 pts

(1) 99% CIs: False with valid reason (2pts)

(2) decreasing sig level: False with valid reason (2pt); false with invalid reason (1pt)

(3) null fail to reject: False with valid reason (1pt)

(4) large sample size: True(2pts); False but explanation demonstrates some understanding of concepts (1pt)

(5) correlation: False with mention of linearity and/or quantitative varbs (1pt)

## 3) 0-5 pts

(a) all means differ: False with valid explanation (2pts); False with invalid statement (1pt)

(b) standardized variability among higher: True (2pts); False but explanation demonstrates some understanding of concepts (1pt)

(c) post hoc: True (1pt); False specify which pairs (1pt)

## 2) 0-5 pts

(a) collinear: False with valid explanation (2pts); False with invalid statement (1pt)

(b) simultaneous one unit change in two predictors: True (2pts); False if stated direction of change matters (2pts)

(b') two observed values of one predictor: True (2pts); False if noticed beta missing hat (2pts)

(b'') influence one observed data point: True (1pts); False if noticed that y\_1 is observed value not predicted or noted fixing other predictors (2pts); False with invalid explanation (1pt)

(c) TSS increase: True (1pt)

## 1) 1 point for each correct number

EC worth 0.02\*65=1.3 points

R example for #12

set.seed(101)

y <- runif(250, -4, 15)

x3 <- runif(250, -5, 50)

#x3 <- rt(250, 5)

#x1 <- (3+runif(250, -3,4))\*y + rnorm(250, 0, 2.5)

x1 <- 3\*y + x3

#x2 <- -(0.7+rnorm(250,0,1.3))\*y + rnorm(250,0,4)

x2 <- -2\*(rnorm(250,3,4))\*y + x3

cor(y,x1)

cor(y,x2)

summary(lm(y ~ x1+x2))$adj.r.squared