

Statistics 515 Practice Exam 3 Answers

Part I:

- 1) **probability of observing a test statistic as extreme as the one observed (or more extreme) if the null hypothesis is true.**
- 2) **The errors are independent. The errors have mean zero at each value of the independent variable. The errors have constant variance at each value of the independent variable. The errors are normally distributed at each value of the independent variable.**
- 3) **$H_0: p=0.3, H_A: p<0.3$.**
- 4) $r = -0.95$ **c** $r = -0.6$ **d** $r = 0.0$ **a** $r = 0.95$ **b**
- 5) When simple linear regression is performed, the \sqrt{MSE} is the estimate of the standard deviation (σ) of the errors.
- 6) **8+1=9** different treatments and **26+1=27** total observations.
- 7) **If μ_i is the mean of treatment group i, then $H_0: \mu_1=\mu_2=\dots=\mu_9$ H_A : at least two are not equal**
- 8) What assumption is checked by constructing a Q-Q plot for each of the treatment groups? **That the errors are normal.**

Part II:

1a) If the we observe a bear of length 28 inches, its estimated weight would be -111.43 pounds!?! Why should we not be concerned about this? **28 inches is below the lowest x value... we would be extrapolating**

b) We are given that $\hat{\beta}_1 = 9.4324$ and $\frac{\sqrt{MSE}}{\sqrt{SS_{xx}}} = 0.7073$. Using $df=n-2=54$ and $\alpha/2=0.025$ we get

$$\hat{\beta}_1 \pm t_{\alpha/2} \frac{\sqrt{MSE}}{\sqrt{SS_{xx}}} = 9.4324 \pm 2.000(0.7073) = 9.4324 \pm 1.4146 = (8.02, 10.85)$$

- c) **This is the prediction interval for the first bear, so 244.3286 to 476.0487 pounds.**
- d) **r-squared=0.7671 so 76.71%**
- e) **The variances of the errors are not constant.**

2a) Source	SS	DF	MS	F	Prob>F
Regression	7.2-2.3=4.9	1	4.9	6.3913	0.08557
Error	2.3000	3	SSE/df=0.7667		
Total	SS_{yy} = 7.2	n-1=5-1=4			

b) $y=5.7-0.7x$ as
Slope=SS_{xy}/SS_{xx}=-7.0/10=-0.7
Intercept=average y - slope*average x = 3.6 - (-0.7)(3) = 3.6 + 2.1 =5.7

c) If β_1 is the slope of the regression line then $H_0: \beta_1=0$ $H_A: \beta_1 \neq 0$

d) **Accept (fail to reject) as 0.08557 > 0.05.**