

STAT 516 Quiz 7 Answers

Parameter Information		
Parameter	Variable	diet
1	Intercept	
2	digeffic	
3	diet	Chow
4		Plants

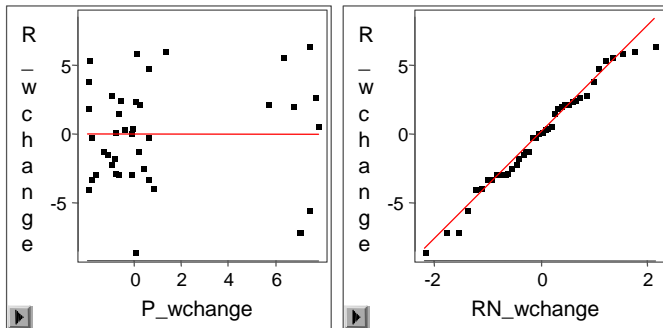
Model Equation									
wchange	=	-	1.9652	+	0.0668	digeffic	+	4.8836	P_3

Summary of Fit			
Mean of Response	1.0952	R-Square	0.4349
Root MSE	3.8541	Adj R-Sq	0.4059

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Stat	Pr > F
Model	2	445.8113	222.9056	15.01	<.0001
Error	39	579.3078	14.8540		
C Total	41	1025.1190			

Type III Tests					
Source	DF	Sum of Squares	Mean Square	F Stat	Pr > F
digeffic	1	31.2630	31.2630	2.10	0.1548
diet	1	61.5683	61.5683	4.14	0.0486

Parameter Estimates								
Variable	diet	DF	Estimate	Std Error	t Stat	Pr > t	Tolerance	Var Inflation
Intercept		1	-1.9652	1.1865	-1.66	0.1057	.	0
digeffic		1	0.0668	0.0460	1.45	0.1548	0.3651	2.7393
diet	Chow	1	4.8836	2.3987	2.04	0.0486	0.3651	2.7393
	Plants	0	0



Type III Tests						
Source	DF	Sum of Squares	Mean Square	F Stat	Pr > F	
digeffic	1	2.8655	2.8655	0.19	0.6652	
diet	1	22.1626	22.1626	1.47	0.2327	
digeffic*diet	1	6.7252	6.7252	0.45	0.5081	

- 1) Give the model equation for the equal slopes ANCOVA, identifying any parameters used.
- 2) Give the estimates for the parameters in the model equation in (1), including the estimated standard deviation of the errors.

$$y_{ij} = \beta_0 + \beta_1 x_{ij} + \tau_i + \varepsilon_{ij}$$

where y_{ij} is the weight change of the j^{th} goose in diet group i (either *plants* or *duck chow*)

β_0 is the intercept for the baseline group (-1.9652)

β_1 is the slope for the digestive efficiency (0.0668)

x_{ij} is the digestive efficiency of the j^{th} goose in diet group i (2.3987 for Chow, Plants is baseline)

τ_i is the effect of being in diet group i (2.3987 for Chow, Plants is baseline)

ε_{ij} is the error for the j^{th} goose in diet group i (root MSE is 3.8541)

- 3) Does the assumption of equal slopes ANCOVA seem to be met for this data set? How could you tell?
Yes, we fail reject the null hypothesis that the interactions are all zero (slopes are equal) with a p-value of 0.5081.
- 4) Which plot do we use to verify that the variances of the errors are constant? Briefly sketch what that plot would look like if the assumption isn't met. **Residual vs. predicted. A fan shape that is wider on one end than the other would be one example, < or > .**
- 5) Does diet appear to have an effect on the weight gain of baby snow geese? **Yes. We reject the null hypothesis that $\tau_{\text{chow}} = \tau_{\text{plant}}$ at $\alpha = 0.05$ with a p-value of 0.0486. (You would say no if you used $\alpha = 0.01$.)**
- 6) $\hat{\beta}_0 = 0$ and $\hat{\beta}_1 = 1$ If $x=1$, what is the estimated probability that $Y=1$? $1/(1+e^{-1}) = .731$