2 pages

Math 484 Quiz 3 Fall 2016 Name___________

label	Estimate	Std. Error	t-value	p-value
Constant	205.408	174.511	1.177	0.2432
sternal height	0.946537	0.0551972	17.148	0.0000
finger to ground	0.175144	0.0910785	1.923	0.0586
bigonal breadth	-0.0531867	0.506338	-0.105	0.9166
cephalic index	-0.309441	0.941529	-0.329	0.7434
head length	0.234152	0.620289	0.377	0.7070
nasal height	0.759272	0.646845	1.174	0.2445

1) Assume that the response variable Y is *height*, and the explanatory variables are X_2 = *sternal height*, X_3 = *finger to ground*, X_4 = *bigonal breadth*, X_5 = *cephalic index*, X_6 = *head length*, and X_7 = *nasal height*. The number of cases $n = 76$.

a) Find a 95% confidence interval for β_2 corresponding to *sternal height*. (show how + table is used)

$r = n - p = df = 76 - 7 = 69$ -.05 -3

∞ 1.96 95%

$\hat{\beta}_2 \pm t_{1-\frac{\delta}{2}, n-p} SE(\hat{\beta}_2) = .946537 \pm 1.96\ (.0551972)$

$= .9465 \pm 0.1082 = \boxed{[0.8383, 1.0547]}$

swapped -5

b) Perform a 4 step test for Ho: $\beta_2 = 0$ corresponding to *sternal height*.

$H_0\ B_2 = 0 \quad H_A\ B_2 \neq 0$

$t_{02} = 17.148$

pval = 0

reject Ho; sternal height is needed in the MLR model for height given the other predictors are in the model

c) Perform a 4 step test for Ho: $\beta_3 = 0$ corresponding to *finger to ground*.

(lots of predictors, so do not list them)

$H_0\ B_3 = 0 \quad H_A\ B_3 \neq 0$

$t_{03} = 1.923$

pval = .0586

fail to reject Ho: finger to ground is not needed in the MLR model for height given the other predictors are in the model.

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Full Model	df	SS	MS	F	p-value
Regression	df_F 9	16771.7	1863.52	1479148.93	0.0000
Residual	235	0.296067 $SSE(F)$	0.00125986	— $MSE(F)$	
Reduced Model	**df**	**SS**	**MS**	**F**	**p-value**
Regression	2	16771.7	8385.85	6734072.02	0.0000
Residual	242 df_R	0.301359 $SSE(R)$	0.00124529		

242 − 235 = 7

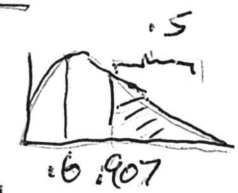
HW3 A) 2.2

2) It is believed that $Y = \beta_1 + \beta_2 X_2 + \beta_3 X_2^2 + e$ where Y is the person's bodyfat and X_2 is the person's density. Measurements on 245 people were taken and are represented by the output above. In addition to a constant $= X_1$, X_2 and $X_3 = X_2^2$, 7 additional measurements $X_4, ..., X_{10}$ were taken. Test whether the reduced model can be used instead of the full model that used $X_1, ..., X_{10}$. Show how the F table is used.

i) Ho the reduced model is good HA use the full model

ii) $F_R = \left[\frac{SSE(R) - SSE(F)}{df_R - df_F}\right] / MSE(F) = \dfrac{\left[\frac{0.301359 - 0.296067}{242 - 235}\right]}{0.00125986}$

$= \dfrac{0.0007560}{0.00125986} = \boxed{0.6001}$



iii) $pval = P(F_{df_R - df_F, df_F} > 0.6) = P(F_{7,235} > 0.6)$

$\simeq P(F_{7,\infty} > 0.6)$ so pval > 0.5 from table: ∞ .5 | .907

iv) Fail to reject Ho; the reduced model is good

or −2

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3) Consider predicting $Y = DAX$ = a major German stock index, from a full model that has a constant, $x_2 = SMI$, $x_3 = CAC$ and $x4 = FTSE$ (3 other major European stock indices). Data was collected during business days (M-F excluding holidays) from 1992-1998 with 1860 observations. Test whether the reduced model that used SMI and a constant is good with the R output shown below.

```
anova(red,full);    Model 1: DAX ~ SMI; Model 2: DAX ~ SMI + CAC + FTSE
  Res.Df       RSS   Df Sum of Sq      F     Pr(>F)
1   1858 38532840
2   1856 22209221     2  16323619 682.07 < 2.2e-16 ***
```

Ho the reduced model is good HA use the full model

$F_R = 682.07$

pval $\simeq 0$

reject Ho: use the full model

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