

# TEST 1 STAT 572 Spring 2000

1. Consider a problem where there are three continuous regressors, A, B, and C. The following residual sums of squares are obtained when fitting the corresponding linear models:

Regressors in model	SSE
A,B,C	5,283
A,B	6,490
A,C	6,141
B,C	5,524
A	6,648
B	6,850
C	5,779

- a) Using partial sums of squares complete the following ANOVA table (20 p):

Source	df	SS	MSE
Model			
A			
B			
C			
Residual			
Total	99	13,837	

Calculations:

b) Test the utility of the model. (5 p)

c) Test the contribution of each regressor to the model. Explain thoroughly your conclusions. (10 p)

d) Delete the regressor with the least contribution to the full model and compute the  $R^2$  of the resulting model. (5 p)

e) Given the magnitude of the sum of the partial sums of squares with respect to the model sum of squares, what do you suspect is happening? (5 p)

f) Suppose that the 100 observations come in pairs. That is, there are two replicates at each point. The pure error sum of squares is 2,145. Test the presence of lack of fit. (10 p)

g) Which is the worst one-regressor model? Does your answer agree with that of question d)? Explain why or why not. (5 p)

2. A study was conducted to investigate the relationships between certain factors found in human blood serum and the amount of HDL. The factors were:

- Y: HDL
- X1: total cholesterol
- X2: total triglyceride
- X3: presence of sinking pre-beta (0 if absent, 1 if present)

The results of fitting the most appropriate model in JMP appear below.

RSquare	0.239345
RSquare Adj	0.157112
Root Mean Square Error	9.738991
Mean of Response	47.7619
Observations (or Sum Wgts)	42

<u>Source</u>	<u>DF</u>	<u>Sum of Squares</u>	<u>Mean Square</u>	<u>F Ratio</u>
Model	4	1104.2449	276.061	2.9106
Error	37	3509.3742	94.848	<u>Prob &gt; F</u>
C. Total	41	4613.6190		0.0344

<u>Term</u>	<u>Estimate</u>	<u>Std Error</u>	<u>t Ratio</u>	<u>Prob&gt; t </u>
Intercept	33.213058	13.32482	2.49	0.0173
X1	0.0423284	0.049803	0.85	0.4008
X2	0.1985709	0.108703	1.83	0.0758
X1*X2	-0.000626	0.000361	-1.73	0.0916
X3[0]	-4.078844	1.51673	-2.69	0.0107

a) Give a full explanation of the effect of X3 on HDL (5 p)

b) What can you conclude based on the fact that the interactions with X3 are not significant? [Hint: Pictures can help](5 p)

c) Use the plots below to explain the effect of X1 and X2 on HDL. (5 p)

