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Answer to Question 12.13 (a):

Answer to Question 12.13 (b):

Adjusted R2= 0.9715 for cubic model; from the plot it seems non-linear and adjusted R2 is the best for the cubic model

Answer to Question 12.13 (c):

Both R2 and Adjusted R2 are the highest for cubic models, so cubic model will be the best choice

Answer to Question 12.13 (d):

The increase is not constant; in between 20 and 60 the rate of increase is different to that of 60-80, and also for 80-100. Weight might not be constant and depends on other factors as well (body type, breed)

Answer to Question 12.30 (a):

The three predictors account for 97.95% of the variation in ratings

Answer to Question 12.30 (b):

(R2/(1-R2)) \* (dferror/dfregression) = ((0.979)2 /(1-0.9792)) \* (496/3) = 3812.946, this is smaller to the overall F statistics = 7925.829

Answer to Question 12.30 (c):

The F-statistic along with the measure of 12.30(b) tells that the three independent vriables are good predictors as they have large values.

Answer to Question 12.31 (a):

0.979566-0.895261 = 0.084305 , 8% reduced

Answer to Question 12.31 (b):

Age is not statistically significant, debt fraction is statistically significant

Answer to NBP-1 (a):

Model 1 and 5

Answer to NBP-1 (b):

Model 2, 3 and 4

Answer to NBP-1 (c):

Model 2 and 4

Answer to NB-SAS Problem -1(a):

[See attached output and SAS code for reference of the values used in answers]

54.5538

This value represents the regression sum square that is added for **β**3 if **β**1, **β**2, **β**4, **β**5 are already added to the model

Answer to NB-SAS Problem -1(b):

R(**β**4, **β**5| **β**1 **β**2 **β**3)

=1.812086+ 24.29437

This value represents the regression sum square that is added for **β**4 and **β**5 if **β**1, **β**2, **β**3 are already added to the model

Answer to NB-SAS Problem -1(c):

Model 4 is nested in model 3

Model 3 is nested in model 1

Model 2 is nested in model 1

Model 4 is nested in model 1

The matrix **β-hat** for model 3 can be found from the matrix **β** of model 1 by adding zeros for co-efficient for **β**4 and **β**5. Similarly, to get model 2 and model 4 from model 1, zeros should be added for **β**3, and **β**3, **β**4, and **β**5 respectively for the matrix **β**-hat for model 1.

Answer to NB-SAS Problem -1(d):

TS= 9.46, p-value < 0.0001

Decision = reject H0, at least one of **β**1, **β**2, **β**3, **β**4, and **β**5 is not null

At least one of the predictors is not null for y.

Individually, **β**1, **β**2, **β**3 are non-zero predictors for y, whereas, **β**4 and **β**5 is not. The problem with the individual analysis is the joint effect of two variables will not be observed.

Answer to NB-SAS Problem -1(e):

T.S = 14.50, p-value < 0.0001

Reject H0, at least one of the estimators **β**4, and **β**5 is non-zero.

Answer to NB-SAS Problem -1(f):

TS=16.75, p-value < 0.0001, reject H0, at least one of the estimators **β**3, **β**4, and **β**5 is non-zero

Answer to NB-SAS Problem -1(g):

Y = -21.542883 + 3.418123x1 – 0.024269x22

Answer to NB-SAS Problem -1(h):

Model adequacy criteria:

Global F-test: TS = 13.37, p-value < 0.0001

95% CIs include zero, so not statistically significant

R2: 0.462, the model only considers 46.30% of the overall variability

Overall, does not satisfy all the adequacy criteria

Answer to NB-SAS Problem -1(i):

Y = 81.7035 – 2.487\* x1 + 0.0544x1x2

Answer to NB-SAS Problem -1(j):

The models are similar because x1 and x2 are negatively correlated. This implies the increase in one will lead to decrease in another; so even though the models look different they imply the same correspondence.

The backward selection method is preferable as it has higher R2 than the forward selection method. The R2 value = 0.609. The 95% CIs for the backward method does not include zero, so the estimators are significant.