Linear HW#6

Tonghao Zhang

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7.22

There is one possible explaination of this phenanimon, multicolinearity among the predictor variables. Because of multicolinearity, two variable can fit the data fairly well while other coefficients are not statsistically significant. But multicolinearity does not inhibit us from obtaining precise estimate value. With more predictor included, the predictions will be more precise.

7.24

a)

$Y = 50.775 + 4.425 \ X_1$

b)

$Y = 37.650 + 4.375X_2 + 4.425X_1$. The coeffcient β_1 from part a is identical to that of 6.5.
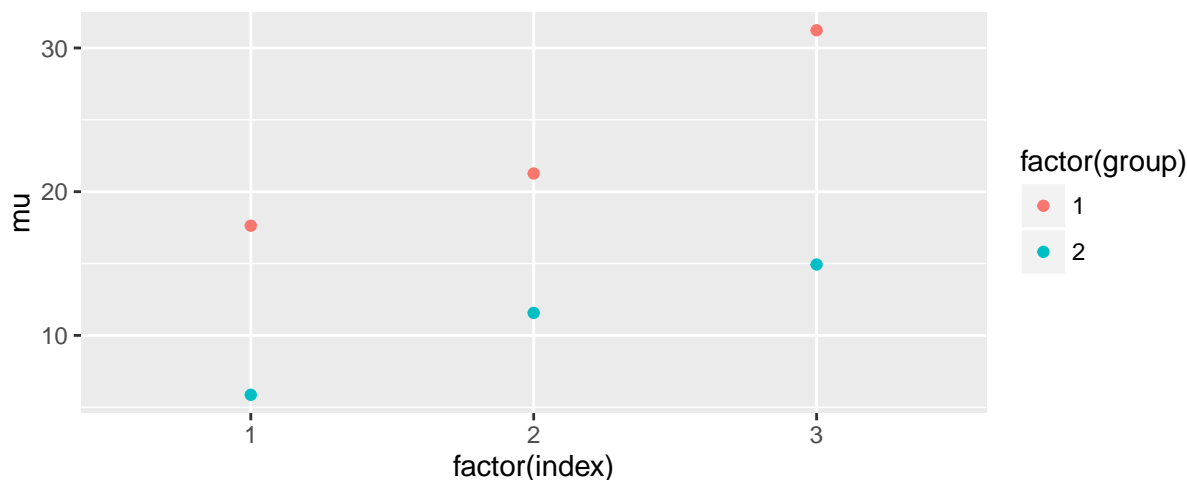
c)

Yes, $\text{SSR}(X_1) = 1566.45$, equals to $\text{SSR}(X_1|X_2) = 1566.45$.

d)

The correlation between $X1$ and X_2 is 0, so the infomation in these two variable does not overlap, the two models from 6.5 and 7.24 produce the same β_1, $\text{SSR}(X_1)$ equals to $\text{SSR}(X_1|X_2)$.
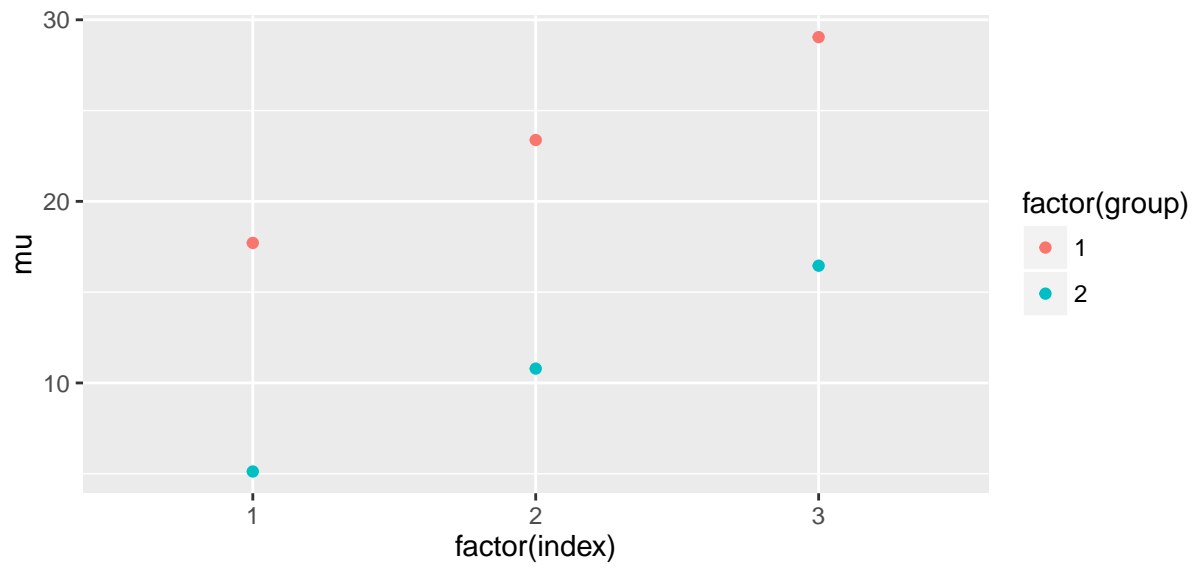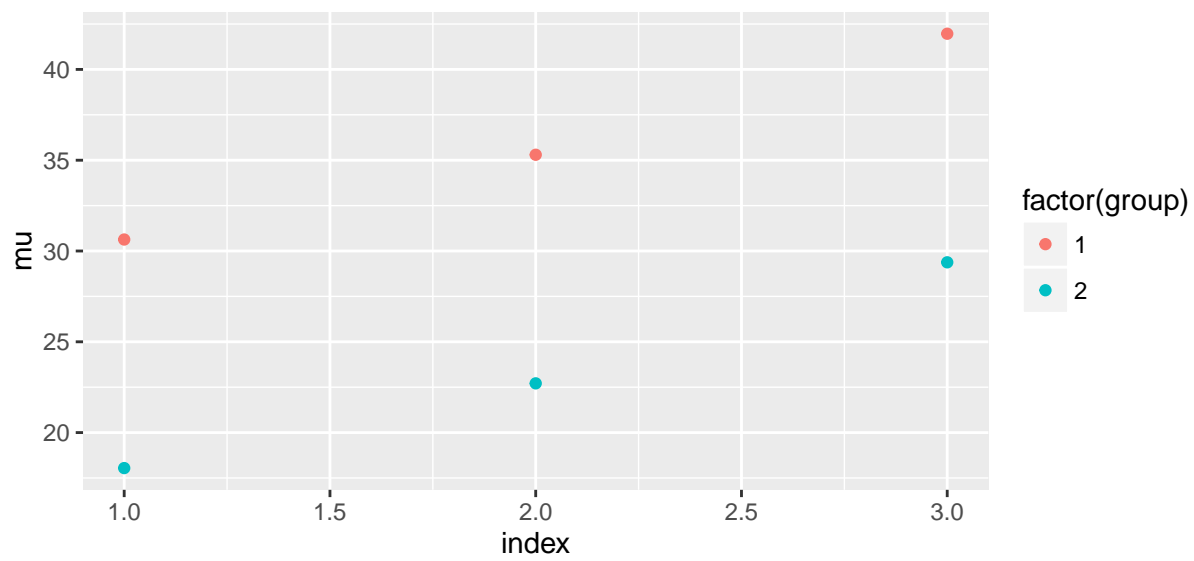
Problem 3

a)

$\beta_0 = 17.633$, $\beta_1 = 3.633$, $\beta_2 = 13.600$, $\beta_3 = -11.767$, $\beta_4 = -6.067$, $\beta_5 = -2.700$.
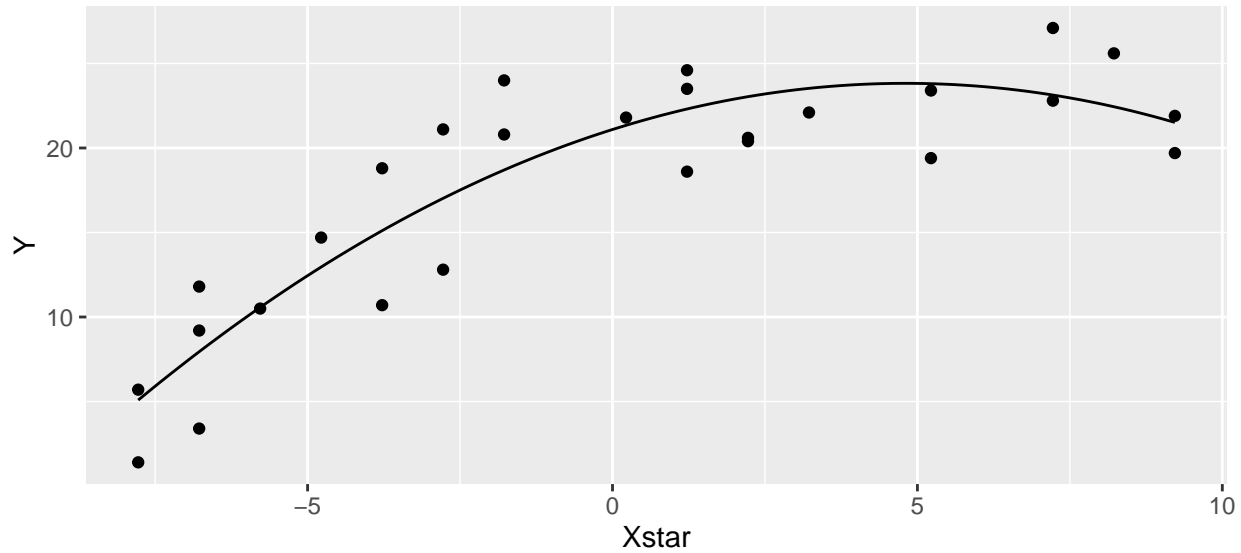
b)

c)

8.6

a)

The plot indicates it's a good fit.

$R^2 = \frac{SSR}{SSTO} = \frac{793.28+252.99}{793.28+252.99+238.54} = 0.814$

b)

Lack of fit test here, H_0 : there is such a regression relationship, H_A: no such regression relationship.

p-value $= 0.8758$, reject H_0.

c)

Bonferroni method: [7.299373,13.84104], [16.977130,23.29872], [20.749504,26.82165].

Working-hotelling [7.094528,14.045886], [16.779176,23.496670], [20.559362,27.011792].

Confidence interval from Bonferroni method is better. The possiblity of all mean at 10, 15, 20 to fall into confidence interval above simutaneously is more than 99%.

d)

Point estimate 20.13792, confidence interval [10.97342,29.30242]

When sample a new female with steriod level of 15, the possiblity of the outcome to fall into confidence level above is more than 99%.
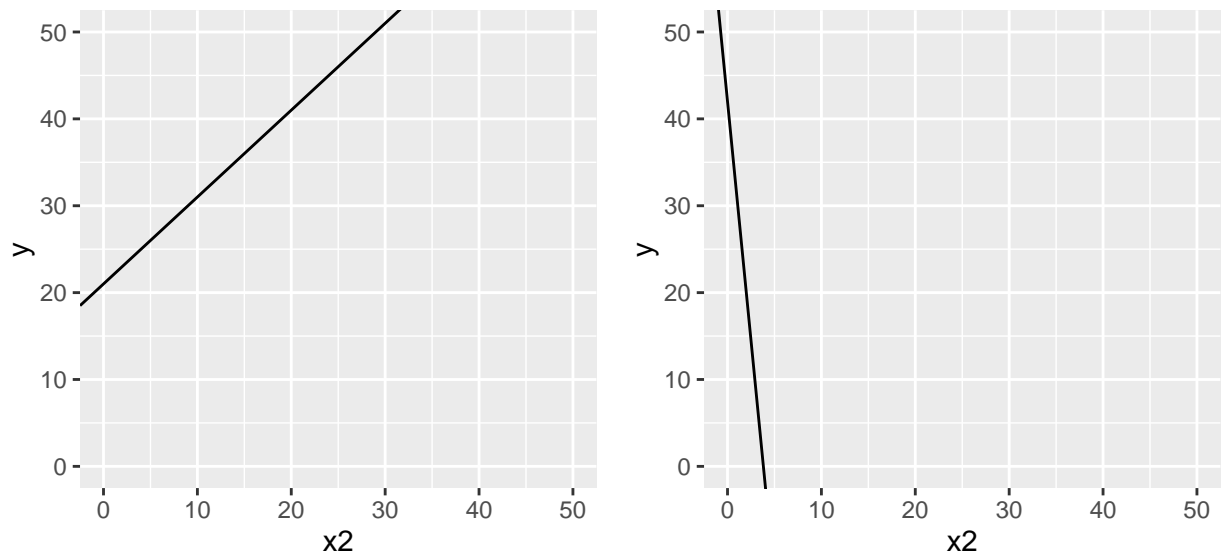
e)

Full model: $Y \sim X + X^2$, reduced model: $Y \sim X$.

F statistic is 25.453, following F(1,24) distribution the p-value is almost 0. Conclude H_0.
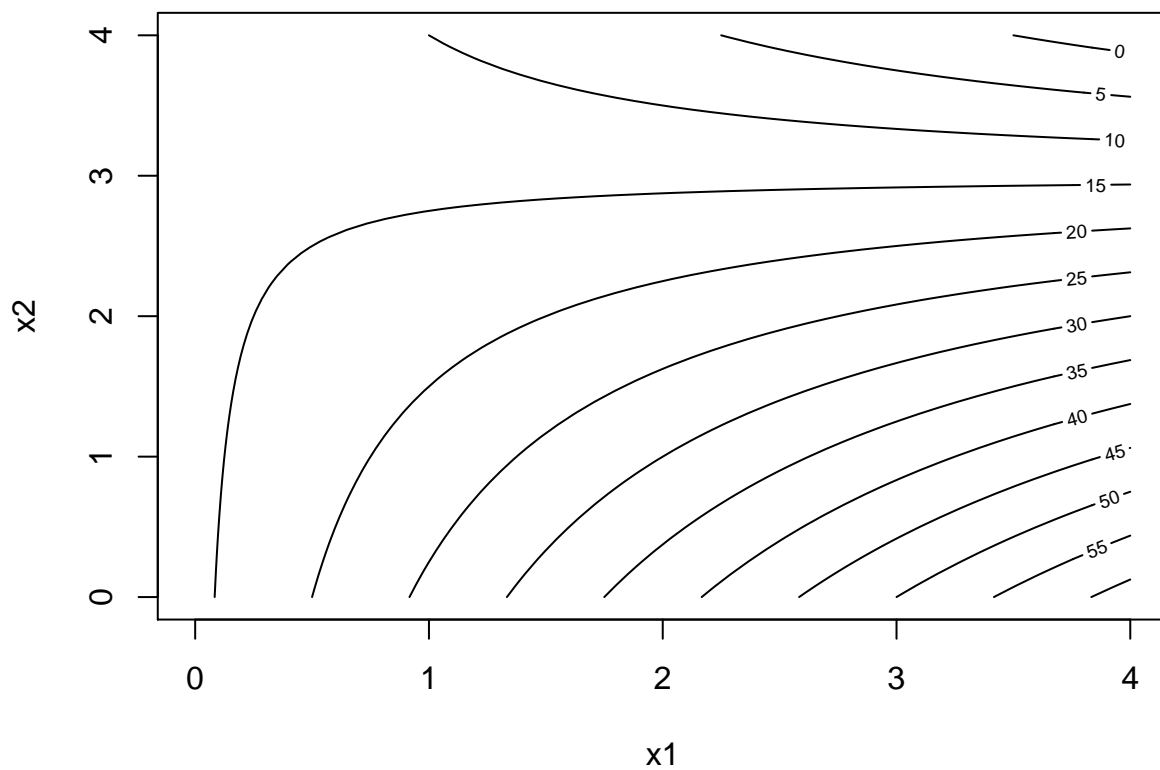
$b_0 = $ -26.325, $b_1 = 4.8736$, $b_2 = $ -0.1184

8.10

a)

The effect of X_1 on mean response depend on X_2, so this model is not additive.

b)

In additive model, the contours should be straight lines. So this model is not an additive one.