Chapter IX: Regression - Exercises

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Exercise

True or false? The general linear model (multiple regression)

$$y_i = \beta_0 + \beta_1 x_{1i} + \ldots + \beta_K x_{Ki} + e_i$$

assumes that:

a) The regressors $X_1, \ldots, X_K$ follow a normal distribution.

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assumes that:

a) The regressors $X_1, \ldots, X_K$ follow a normal distribution. **False**

b) The variance of $X_1, \ldots, X_K$ must be constant.

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c) The response variable Y conditional on the observed values $\vec{X}$ must be constant.

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d) The term of error e should be homoskedastic.

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e) The effects of the variables that are not included in the regressors have a joint effect that can be modeled as normal with mean zero.

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e) The effects of the variables that are not included in the regressors have a joint effect that can be modeled as normal with mean zero. **True**

f) Parameters $\beta_0, \beta_1, \ldots, \beta_K$ must be positive.

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e) The effects of the variables that are not included in the regressors have a joint effect that can be modeled as normal with mean zero. **True**

f) Parameters $\beta_0, \beta_1, \ldots, \beta_K$ must be positive. **False**

Exercise

True or false? Be the following multiple regression model:

$$Y = 10 + 0.5X_1 - 3X_2 + e$$

with $e \sim N(0, \sigma^2 = 1)$.

a) If $X_1 = 0$ and $X_2 = 0$ then $Y \sim N(10, 1)$.

b) If $X_1 = 1$ and $X_2 = 1$ then $Y = 12$.

c) If $X_1 = 1$ and $X_2 = 1$ then $Y \sim N(7.5, 1)$.

d) If If $X_1 = 1$ and $X_2 = 1$ then $\hat{Y} = 7.5$.

e) If If $X_1 = 1$ and $X_2 = 1$ then $Y = 7.5$.

f) If If $X_1 = 1$ and $X_2 = 1$ then $E[Y|X_1, X_2] = 10$.

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c) If $X_1 = 1$ and $X_2 = 1$ then $Y \sim N(7.5, 1)$. **True**

d) If If $X_1 = 1$ and $X_2 = 1$ then $\hat{Y} = 7.5$. **True**

e) If If $X_1 = 1$ and $X_2 = 1$ then $Y = 7.5$. **False**

f) If If $X_1 = 1$ and $X_2 = 1$ then $E[Y|X_1, X_2] = 10$. **False**

Exercise

True or false? Be the following multiple regression model:

$$Y = 10 + 0.5X_1 - 3X_2 + e$$

with $e \sim N(0, \sigma^2 = 1)$.

a) If X_1 increases by one unit and X_2 stays constant, the mean of Y increases by $10 + 0.5 = 10.5$ units.

b) If X_1 increases by one unit and X_2 stays constant, the mean of Y increases by 0.5 units.

c) If X_2 increases by one unit and X_1 stays constant, Y decreases on average by 3 units.

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b) If X_1 increases by one unit and X_2 stays constant, the mean of Y increases by 0.5 units. **True**

c) If X_2 increases by one unit and X_1 stays constant, Y decreases on average by 3 units. **True**