Chapter 3 Portfolio Contribution

Required for undergraduate and graduate students:

I have created a dataset {Chapter3PortfolioData.txt}. Please read this dataset into R. Fit a frequentist linear regression model of the form Yi = α + β Xi­ + εi and create a plot showing the data as well as the fitted regression line. [Since I have not told you the manner in which I created the data, you do not know what is the actual regression line, and so you cannot show that in your plot. This, of course, resembles real-world scenarios in which the actual relationship between variables is not known but must be inferred from data.]

Please also create a plot of the residuals against the corresponding values of the X variable.

Write a paragraph describing what you see in these two plots, and comment in particular on whether any observations seem to stand out. Please include an appendix with your R code.

To accomplish the above, you can proceed most easily by referring to the file {Chapter3bNotes.txt} and adapting the R code in EXAMPLE #8. If proceeding in this manner, please (as a matter of academic propriety) acknowledge such adaptation of the existing R code in your appendix.

Required for graduate students only:

Create a vector in R containing the sample means of the X and Y variables. Create a matrix in R containing the sample variances and covariance. Define Mahalanobis distance according to these sample means, variances, and covariance. [Since I have not told you the manner in which I created the data, you do not know what are the actual means, variances, and covariance.]

Then, for each observation in the dataset, compute its Mahalanobis distance from the vector of sample means.

Write a paragraph describing whether any observations seem to stand out based on Mahalanobis distance. Are these the same observations flagged by the two plots constructed earlier? Please include an appendix with your R code.

To accomplish the above, you can proceed most easily by referring to the file {Chapter3aNotes.txt} and adapting the R code in EXAMPLE #5. If proceeding in this manner, please (as a matter of academic propriety) acknowledge such adaptation of the existing R code in your appendix.