

The purpose of lab today is to work through examples of several different multiple linear regression models.

First SAS code is clock.sas.

The second SAS code is about CO2_2014Vehicles and corresponding data analysis.

Data on new vehicles for the 2014 model year are available from the Environmental Protection Agency. A random sample of 200 vehicles was selected. Using these data we wish to predict the CO2 emissions of the vehicles in city driving (cityCO2). The explanatory variables are listed below.

- Engine – displacement of the engine in liters (Min = 1, Max = 6.8)
 - Cylinder – number of cylinders (Min = 3, Max = 12)
 - City MPG – Fuel economy in city driving (MPG) (Min = 11, Max = 40)
 - Gears – number of gears (Min = 1, Max = 9)
 - Intake – Number of intake valves per cylinder (Coded as 1 if 2 and 0 otherwise)
 - Exhaust – Number of exhaust valves per cylinder (Coded as 1 if 2 and 0 otherwise)
1. Use SAS to run the multiple linear regression model with Engine, Cylinder and City MPG. Use the output to answer the following questions.
 - a. Give the equation for predicting the cityCO2 values from the three explanatory variables.
 - b. Conduct an F-test for the overall model in helping to explain the cityCO2 values. Report the null and alternative hypotheses, test statistic, p-value, decision and conclusion.
 - c. Give the value of R^2 for this model and interpret its value.
 - d. Conduct a t-test for the significance of Engine in the model that includes Cylinder and City MPG. Report the null and alternative hypotheses, test statistic, p-value, decision and conclusion.
 2. Use SAS to run the multiple linear regression model with Engine, Cylinder, CityMPG and Gears as explanatory variables. Use the output to answer the following questions.
 - a. How much does adding Gears to the multiple linear regression model with Engine, Cylinder and City MPG reduce the SS for Error?
 - b. How much does adding Gears to the multiple linear regression model with Engine, Cylinder and City MPG increase the value of R^2 ?
 - c. Conduct a F-test for the effect of adding Gears to the multiple linear regression model with Engine, Cylinder and City MPG. Report the null and alternative hypotheses, test statistic, p-value, decision and conclusion.
 3. Use SAS to run the multiple linear regression model with Engine, Cylinder, City MPG, Gears and Intake as explanatory variables. Use the output to answer the following questions.
 - a. Give the equation for predicting the cityCO2 values from the four explanatory variables for vehicles with two intake valves per cylinder and for vehicles that do not have two intake valves per cylinder. What is the difference in these two equations?
 - b. Conduct a t-test for the significance of Intake in the model that includes Engine, Cylinder, City MPG and Gears. Report the null and alternative hypotheses, test statistic, p-value, decision and conclusion.