

Steel Activity 2

Your Name Here

Learning Outcomes

- Use a multiple regression model
- Consider a multiple regression model that models both quantitative and categorical variables, some with more than two levels
- Understand issues of multicollinearity in a model
- Interpreting model coefficients

Squishing Steel Case Study

Recall the case study involving a commercial steel mill that is involved in the process of “squishing steel”, as we will call it. A slab of steel is sent through different roll stands, with the end result being a sheet of steel that has achieved a desired gauge. The response variable of interest is Force, a quantitative measure of the roll force for each coil. The predictors including the below variables:

- avg.width: the average slab width (Q)
- temperature: temperature of slab at the roll stand (Q)
- entry.gauge: the slab gauge at the entry of the roll stand (Q)
- exit.gauge: the slab gauge at the exit of the roll stand (Q)
- roller.diameter: the diameter of the roller (Q)
- caster.id: location of the caster (North versus South)
- stand.id: one of five roll stands the steel sheet passes through (F1 - F5)

Part 1

The following research question will be investigated in Part 1: Is the roll stand significant when using temperature to predict the Force?

TASK 1.1 Perform EDA to determine whether you believe that the roll stand will be significant in a model that uses temperature to predict the force. Make two meaningful comments about the plot that you produce.

Comment 1

Comment 2

TASK 1.2 Create a model that uses temperature to predict the force, when accounting for the roll stand. Report the fitted model.

Response

TASK 1.3 Interpret the coefficient for temperature in context.

Response

Part 2

The following research question will be investigated in Part 2: Is temperature useful after accounting for other potentially related predictors?

TASK 2.1 Fit a full first-order model with all QUANTITATIVE variables. Discuss the predictive power of this model.

Response

TASK 2.2 Do the conditions of this model appear to be reasonably met? Justify your answer.

Response

Task 2.3 Do you have any concerns about multicollinearity within this model? Justify your answer by looking at the variance inflation factors.

Response

Task 2.4 Remove the variable with the highest variance inflation factor and rerun your model. Do you see improvements? Explain.

Response

TASK 2.5 Now create a multiple regression model that includes all quantitative predictors and one reasonable categorical predictor (hint: look at your EDA from your first Steel Assignment). Report the coefficient for Temperature.

Response

TASK 2.5 Interpret the coefficient for temperature in context.

Response

TASK 2.6 Consider what you know about the force necessary to change the shape of an object when it is hot versus cold. Now look at your coefficient for temperature. Do you have any concerns about the interpretation with this model?

Response