

JMP® Introductory Lab Activities

Activity 18: Inference for Regression



Data Sets: Body Measurements.jmp

Summary

In *Gulliver's Travels*, the Lilliputians make an entire set of clothes for the (giant) Gulliver by taking only a few measurements from his body:

“The seamstresses took my measure as I lay on the ground, one standing at my neck, and another at my mid-leg, with a strong cord extended, that each held by the end, while a third measured the length of the cord with a rule of an inch long. Then they measured my right thumb, and desired no more; for by a mathematical computation, that twice round the thumb is once round the wrist, and so on to the neck and the waist, and by the help of my old shirt, which I displayed on the ground before them for a pattern, they fitted me exactly.” (Swift, 1735)

In this lab, you will construct models to predict the mass of a person based on physical measurements, and will conduct tests to determine whether these characteristics are statistically significant in predicting mass.

The Body Measurements Data

Open the file **Body Measurements.jmp** from the JMP **Sample Data** directory. The data set contains measurements collected as part of a statistics project in Australia. These data are measurements from 22 randomly selected male subjects.

The variable **Mass** is measured in kilograms, and all other variables are measured in centimeters.

Exploring the Relationship Between Body Mass and Other Variables

First you will examine body mass versus forearm length. Go to **Analyze > Fit Y By X**. Select the appropriate variables for the **Y, Response** and **X, Factor**, based upon the goal mentioned above. Select **Fit Line** from the red triangle.

Examine the numbers that appear under **Parameter Estimates**.

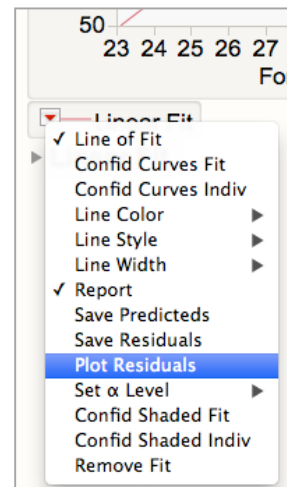
For both the intercept and the slope of the line, there is an estimate of the parameter, its standard error, a t-ratio, and a corresponding p -value.

▼ Parameter Estimates				
Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	-68.6441	15.58879	-4.40	0.0003*
Fore	5.1336663	0.560024	9.17	<.0001*

You should also look at residual plots to help determine if the conditions for using linear regression tests are reasonable.

To examine the residual plot, click on the red triangle next to **Linear Fit** (below the graph) and select **Plot Residuals**.

This produces several residual plots.



Repeat this procedure for body mass versus shoulder width.

Repeat the same procedure for body mass versus two other body measurements. (Note: You can enter more than one variable at a time as the **X, Factor**.)

Write Your Report

For each of the regression lines conduct a hypothesis test using one of the commonly used significance levels to determine if there is a useful linear relationship between body mass and the other factor.

Remember to include:

- *Assumptions*
- *Hypotheses*
- *Sample statistic values*
- *The test statistic*
- *The p-value, and*
- *Conclusions in the context of the problem.*

Include copies of the scatter plots and regression analysis from JMP for each pair of variables in your report.

From the four regression analyses you have completed, determine which of these you consider to be the best choice for predicting body mass. Explain why.

Reference: Swift, Jonathan (1735). *Gulliver's Travels*. Quote is from p. 44 of the *Norton Critical Edition*, (1961) Robert A. Greenwood, ed. New York: W. W. Norton & Co.