Overview

In this lab you will be introduced to using JMP for polynomial regression analysis.

Warm-up Exercise

Polynomial regression is available in JMP using either the **Fit Y by X** or the **Fit Model** platform. We will focus on **Fit Y by X** which is under the Analyze pull-down menu. This handout illustrates obtaining polynomial regression output from JMP’s **Fit Y by X** analysis platform.

In class we introduced the example involving the U. S. Population. The response variable, Y, is the U. S. Population. The explanatory variable is the Year the census was taken. The data is available on the course web page

[www.public.iastate.edu/~wrstephe/stat401.html](http://www.public.iastate.edu/~wrstephe/stat401.html)

Go to the course web page and open the data for the U. S. Population example with JMP.

1. In JMP go to **Analyze** and **Fit Y by X**. Cast Population into the role of Y: Response. Cast **Year** into the role of the X, Factor. Click on OK. The output consists of a plot of the data. Right click on the Year axis and select Axis Settings. Make the Minimum 1770, the Maximum 2030, the Increment 50 and the # Minor Ticks 4. Right click on the Population axis and select Axis Settings. Change the Maximum to 400 and the # of Minor Ticks to 4.

2. From the red triangle pull down next to Bivariate Fit of Population by Year select Fit Line. This will produce the output for the simple linear regression of Population on Year. You can add plots of residuals by going to the red triangle pull down next to Linear Fit and choosing Plot Residuals.

3. From the red triangle pull down next to Bivariate Fit of Population by Year select Fit Special. For Degree choose 2 Quadratic and click to remove the check mark next to Centered Polynomial. Click on OK. This will fit a polynomial regression model with Year and Year$^2$. Again you can add plots of residuals by going to the red triangle pull down next to Polynomial Fit Degree=2 and choosing Plot Residuals.

4. You can also fit polynomials by choosing the Fit Polynomial from the red triangle pull down next to Bivariate Fit of Population by Year. Make this selection and select 2, quadratic. What is different about this fit compared to the one above? Compare the entries in the Summary, Analysis of Variance and Parameter Estimates sections of the output.

5. Add a new column to your JMP data table called **YearCtr**. Go to Col – Formula and enter the formula Year – ColMean(Year). Go back to Fit Y by X and select Population as the Y, Response and YearCtr as the X, Factor. This time choose Fit Polynomial - 2, quadratic. Note the prediction equation. Go to the red triangle pull down next to Polynomial Fit Degree=2 and Save Predicteds and Save Residuals.

6. Analyze the distribution of residuals to see if they could have come from a normal distribution. What do you notice?