BIOS 645 Homework #4

1. Graphs B, E, and H show curvature.
2. Table

   Description automatically generated Chart, scatter chart

   Description automatically generated

From our simple linear regression of steroid levels in the bloodstream onto woman’s age, we get an intercept of 4.93 (95% CI: (1.15,8.71)) and a slope of 0.615 (95% CI (0.42,0.81)). This means that for every unit increase in age, there is 0.615 increase in bloodstream steroid levels. The p-value for the slope is less than 0.0001, meaning that the likelihood of observing a slope equal to or more extreme than 0.615, assuming that the null is true, is less than 0.01%. Using the arbitrary value of alpha=0.05, our p-value of 0.0001 tells us that we have sufficient evidence to reject the null hypothesis.

Chart

Description automatically generated with medium confidence Chart, line chart

Description automatically generated

The fit diagnostics for the regression of steroid level onto age is above. Here, we can see that the residual distribution is close to normal and the qq-plot follows a 45-degree angle fairly closely. The residual plot also does not have a smooth LOESS line so it might be a better idea to try adding another polynomial term.

1. Table

   Description automatically generated Chart, scatter chart

   Description automatically generated

The final model regresses steroid level in bloodstream on (age)^2. We get an intercept of 8.39 (95% CL: (5.66,11.12)) and a slope of 0.021 (95% CL: (0.014, 0.027)). This means that for every unit increase in (age)^2, there is 0.021 increase in bloodstream steroid levels. The slope of the regression line has a 95% confidence interval of (0.014, 0.027).  This means if we conduct the same study many times, 95% of our computed confidence intervals would contain the true slope. The p-value for the slope is less than 0.0001, meaning that the likelihood of observing a slope equal to or more extreme than 0.021, assuming that the null is true, is less than 0.01%. Using the arbitrary value of alpha=0.05, our p-value of 0.0001 tells us that we have sufficient evidence to reject the null hypothesis.

Diagram, engineering drawing

Description automatically generated with medium confidenceChart, line chart, scatter chart

Description automatically generated

The residual plot looks normal and the histogram has a right skew. The qq-plot is angled at 45 degrees for the most part. The residuals look homoscedastic as well. The residual plot has a smoother LOESS line compared to the one previously.