

Stat 6021: Interpretation of Regression Coefficients with Log Transformation on Predictor

1 Interpreting Regression Coefficients: Log Transformation on Predictor

One of the reasons a log transformation is a popular transformation is that regression coefficients are still fairly easy to interpret. Consider a log transformation applied to the predictor. The least-squares regression equation becomes

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 \log x \quad (1)$$

When the predictor variable increases by 10%, (1) becomes

$$\hat{y}_{new} = \hat{\beta}_0 + \hat{\beta}_1 \log(1.1x) \quad (2)$$

Consider the difference between \hat{y}_{new} and \hat{y} using (1) and (2), i.e.,

$$\hat{y}_{new} - \hat{y} = \hat{\beta}_1 \log(1.1) \quad (3)$$

From (3), we see for a 10% increase in the predictor, the predicted response variable increases by $\hat{\beta}_1 \log(1.1)$. In general, for an $a\%$ increase in the predictor, the predicted response increases by $\hat{\beta}_1 \log(1 + \frac{a}{100})$.