

# 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  $\hat{\beta}_1 \log(1 + \frac{a}{100})$ .