**Chapter 10: Simple Linear Regression**

**(Steps for performing a simpler linear regression analysis)**

**Step 1: Hypothesize the deterministic component of the model that relates the mean E(y), to the independent variable x.**

$E\left(y\right)=β\_{0}+β\_{1}x$ (for population)

Modeled by: $\hat{y}=\hat{β\_{0}}+\hat{β\_{1}}x$ (for sample)

**Step 2: Use the sample data to estimate unknown parameters in the model**

* Find the slope () from the sample data
* Find the y-intercept () from the sample data
* Be able to interpret these values

Note: the “hats” on the parameters means these are values that have been estimated by the sample – similar to the “hat” on sample proportion

**Step 3: Specify the probability distribution of the random error term and estimate the standard deviation of this distribution**

* Check assumptions of probability distribution of random error ε
* Find the estimate for the standard error of the regression model (s)
* Be able to interpret this value

**Step 4: Evaluate the usefulness of the model**

Statistically Useful?

* Hypothesis test of β1
* Calculate coefficient of correlation (r)
* Interpret coefficient of correlation
* Calculate coefficient of determination (r2)
* Interpret coefficient of determination

Practically Useful?

* Is r2 large and s small (compared to context of y-values).

**Step 5: When satisfied that the model is useful (practially and statistically), use it for prediction, estimation, and other purposes**

* Use line for prediction and estimation
* Create confidence intervals for estimation