Population Parameters	*Estimators (Sample)*
Univariate Measures (distribution of a single variable – Y)	
$\mu_Y = E[Y] = \sum_{i=1}^{N} f_i Y_i = \frac{\sum Y_i}{N}$	$\bar{Y} = \frac{\sum Y_i}{n}$
$\sigma_Y = \sqrt{\frac{\sum (Y_i - \mu_Y)^2}{N}}$	$s_Y = \sqrt{\frac{\sum (Y_i - \bar{Y})^2}{n-1}}$
Sampling Distribution for $\bar{Y}$	
$\sigma_{\bar{Y}} = \frac{\sigma_Y}{\sqrt{n}}$	$s_{\bar{Y}} = \frac{s_Y}{\sqrt{n}}$
Bivariate Measures (joint distribution of X and Y)	
$Cov(X\ Y) = \sum_{i=1}^{N} \frac{1}{N}(X_i - \mu_X)(Y_i - \mu_Y)$	$s_{XY} = \frac{\sum (X_i - \bar{X})(Y_i - \bar{Y})}{n-1} = \frac{\sum x_i y_i}{n-1}$
$\rho_{XY} = \frac{Cov(X\ Y)}{\sigma_X\ \sigma_Y}$	$r_{XY} = \frac{s_{XY}}{s_X\ s_Y}$
Portfolio Expected Return and Risk	
$E(P) = wE(X) + (1-w)E(Y);\ \sigma_P = \sqrt{w^2\sigma_X^2 + (1-w)^2\sigma_Y^2 + 2w(1-w)\sigma_{XY}}$	
Regression Measures (X causes Y to change)	
β_1	$\hat{\beta}_1 = \frac{\sum X_i Y_i - n\bar{X}\bar{Y}}{\sum X_i^2 - n\bar{X}^2} = \frac{\sum x_i y_i}{\sum x_i^2} = \frac{\sum x_i Y_i}{\sum x_i^2}$
β_0	$\hat{\beta}_0 = \bar{Y} - \hat{\beta}_1 \bar{X}$
$E[Y \mid X] = \beta_0 + \beta_1 X$	$\hat{Y} = \hat{\beta}_0 + \hat{\beta}_1 X$
$\sigma^2 = Var(u_i) = E[u_i^2]$	$\hat{\sigma}^2 = \frac{\sum e_i^2}{n-K-1}$
Sampling Distributions for OLS Estimators	
$\sqrt{Var(\hat{\beta}_0)} = \sigma_{\hat{\beta}_0} = \sqrt{\frac{\sigma^2 \sum X_i^2}{n \sum x_i^2}}$	$s_{\hat{\beta}_0} = \sqrt{\frac{\hat{\sigma}^2 \sum X_i^2}{n \sum x_i^2}}$
$\sqrt{Var(\hat{\beta}_1)} = \sigma_{\hat{\beta}_1} = \sqrt{\frac{\sigma^2}{\sum x_i^2}}$	$s_{\hat{\beta}_1} = \sqrt{\frac{\hat{\sigma}^2}{\sum x_i^2}}$
$\sqrt{Var(\hat{Y}_0)} = \sigma_{\hat{Y}_0} = \sqrt{\sigma^2\left[\frac{1}{n} + \frac{(X_0 - \bar{X})^2}{\sum x_i^2}\right]}$	$s_{\hat{Y}_0} = \sqrt{\hat{\sigma}^2\left[\frac{1}{n} + \frac{(X_0 - \bar{X})^2}{\sum x_i^2}\right]}$

Confidence intervals for μ_Y – univariate distribution:

σ_Y is known: $\bar{Y} \pm z_{(\alpha/2)} \cdot \sigma_{\bar{Y}}$; σ_Y is not known: $\bar{Y} \pm t_{(\alpha/2,\, n\text{-}1)} \cdot s_{\bar{Y}}$

Standardized Test Statistics:

σ_Y is known: $$z_{calc} = \frac{\bar{Y} - \mu_Y{}^0}{\sigma_{\bar{Y}}} = \frac{\bar{Y} - \mu_Y{}^0}{\sigma_Y / \sqrt{n}}$$

σ_Y is not known: $$t_{calc} = \frac{\bar{Y} - \mu_Y{}^0}{s_Y / \sqrt{n}}$$

Confidence intervals for β_1 - regression analysis:

σ^2 is known: $\hat{\beta}_1 \pm z_{(\alpha/2)} \cdot \sigma_{\hat{\beta}_1}$; σ^2 is not known: $\hat{\beta}_1 \pm t_{(\alpha/2, n-2)} \cdot s_{\hat{\beta}_1}$

Standardized Test Statistics for β_1:

σ^2 is known: $z_{calc} = \dfrac{\hat{\beta}_1 - \beta_1^0}{\sigma_{\hat{\beta}_1}}$; σ^2 is not known: $t_{calc} = \dfrac{\hat{\beta}_1 - \beta_1^0}{s_{\hat{\beta}_1}}$

Confidence intervals for $E[Y|X_0]$ - regression analysis:

σ^2 is known: $\hat{Y}_0 \pm z_{(\alpha/2)} \cdot \sigma_{\hat{Y}_0}$; σ^2 is not known: $\hat{Y}_0 \pm t_{(\alpha/2, n-2)} \cdot s_{\hat{Y}_0}$

Goodness of Fit: $R^2 = \dfrac{ESS}{TSS} = 1 - \dfrac{\sum e_i^2}{\sum y_i^2}$ Adjusted R^2: $\bar{R}^2 = 1 - \dfrac{RSS}{TSS}\left(\dfrac{n-1}{n-K-1}\right)$

Adjusted R^2: $\bar{R}^2 = 1 - \left(1 - R^2\right)\left(\dfrac{n-1}{n-K-1}\right)$

Variance Inflation Factor: $VIF = \dfrac{1}{1 - R_j^2}$

Calculated F-statistics: $F_{calc} = \dfrac{ESS/K}{RSS/(n-K-1)}$ $F_{calc} = \dfrac{[ESS_{(2)} - ESS_{(1)}] / (K_{(2)} - K_{(1)})}{RSS_{(2)} / (n - K_{(2)} - 1)}$

Interpretation of dummy variable coefficient for *lnY*: $g^* = \left(e^{\hat{\delta}} - 1\right) \times 100 = \%$ change in Y