III. Simple Regression.

A. Introduction

B. Population Regression Equation

C. Sample Regression Equation

D. Ordinary Least Squares

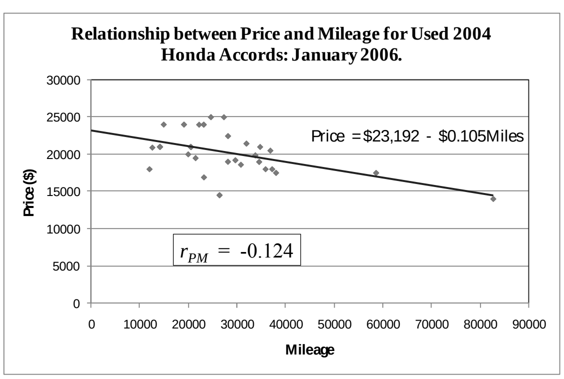
7. Interpretations

E. Classical Regression Model.

F. Properties of OLS Estimators (**BLUE**)

Personalized Used 2004 Honda Accord Samples.

- Personalized PRS questions in class tomorrow.
- Go to the course website.
- Download ***your*** data from the course website – same as the data used for Exam 1.
- Create an Excel Spreadsheet. Include:
  - Means, Standard Deviations.
  - Correlations
  - XY Scatter Diagram
  - OLS Regression Results
- Bring these with you to class – we'll use them for **Personalized PRS Questions**.

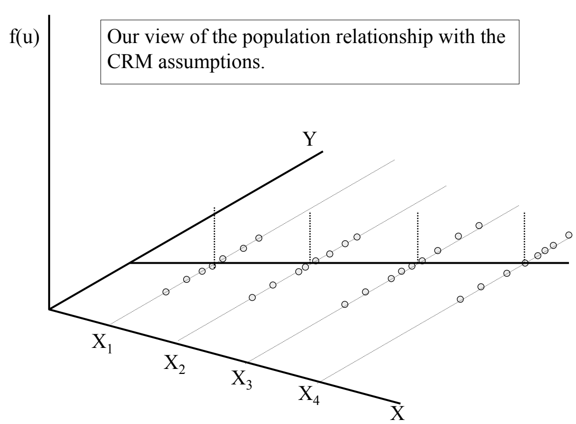


E. Classical Regression Model

1. Introduction – CRM why do we need this?
   - What does OLS provide?
   - Is this enough?

2. CRM Assumptions:

1) $Y_i = \beta_0 + \beta_1 X_i + u_i$ is the ***true model***.
2) ***X is not a random variable***.
3) $E[u \mid X_i] = 0$, at each level of X.
4) $Var(u_i) = \sigma^2$, for all levels of X.
   (or $E[u_i] = \sigma^2$ - ***Homoskedasticity***)
5) $Cov(u_i u_j) = 0$, for $i \neq j$.
   (or $E(u_i u_j) = 0$ - ***Non-autocorrelation***)
6) ***u*** is **distributed normally**.



F. Properties of OLS Estimators

- What properties do we want for our estimators?
- What are we trying to describe?
- Use expected values to determine:

  Center –

  Variance –

OLS Estimators

$$\hat{\beta}_1 = \frac{\sum X_i Y_i - n\overline{X}\,\overline{Y}}{\sum X_i^2 - n\overline{X}^2} = \frac{\sum x_i y_i}{\sum x_i^2} = \frac{\sum x_i Y_i}{\sum x_i^2}$$

$$\hat{\beta}_0 = \overline{Y} - \hat{\beta}_1 \overline{X}$$

Given the CRM Assumptions, the ***Sampling Distributions*** have the following ***centers*** and ***variances***:

$$E[\hat{\beta}_0] = \beta_0 \qquad \sigma_{\hat{\beta}_0} = \sqrt{\frac{\sigma^2 \sum X_i^2}{n \sum x_i^2}}$$

$$E[\hat{\beta}_1] = \beta_1 \qquad \sigma_{\hat{\beta}_1} = \sqrt{\frac{\sigma^2}{\sum x_i^2}}$$