Consolidated Notes Exam 1 Econ 300

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The following is intended to cover major topics you should understand for exam 1

Stats Review

You should be able to

- Interpret the mean and standard deviation in words and graphically
- Understand the central limit theorem and under what conditions it holds
- Interpret covariance and correlation both in words and graphically
- Interpret the intercept and slope of a linear equation
- define/differentiate between a dependent and independent variable

Bivariate OLS

You should be able to

- Write the regression equation / estimating equation / "core model" for a bivariate regression
- Interpret the error term and what is included in it
- Interpret the slope and intercept within the context of a model
- Calculate $\hat{y}, \hat{\varepsilon}$ given model parameters
- Understand the process of Ordinary Least Squares (OLS) conceptually and why we use squared errors instead of errors
- Understand the difference between β and $\hat{\beta}$ and why they can differ from each other
- Define bias and give the condition required for estimates to be unbiased (both the definition and the intuition)
- Understand the sampling distribution of $\hat{\beta}_1$ and its implications
  - Know under what conditions we will have a precise (low variance) estimation of $\hat{\beta}_1$
  - Know the assumptions behind calculating standard errors for $\hat{\beta}_1$

Important Equations:

- $var(x) = E[(x-\mu)^2] = (x_1-\bar{x})^2 + (x_2-\bar{x})^2 + ... + (x_n-\bar{x})^2$: variance formula
- $y_i = \beta_0 + \beta_1 x_i + \varepsilon_i$: "The core model"
  - $y_i = \hat{\beta}_0 + \hat{\beta}_1 x_i + \hat{\varepsilon}_i$: What we estimate using OLS
  - $\hat{y}_i = \hat{\beta}_0 + \hat{\beta}_1 x_i$: How we predict y
- $\hat{\beta}_1 = cor(x,y)\frac{\sigma_y}{\sigma_x}$: How we calculate $\hat{\beta}_1$
- $E[\hat{\beta}_1] = \beta_1 + cor(x,\varepsilon)\frac{\sigma_\epsilon}{\sigma_x}$: How we calculate bias
- $var(\hat{\beta}) = \frac{\hat{\sigma}^2}{n\sigma_x^2}$: For calculating sampling distribution