ECON2300 Summary

Lecture 1

1. Economics and Econometrics
   - Econometricians are not just concerned with measuring the size of economic variables – they are interested in measuring and assessing the strength and form of economic relationships

2. Statistics
   - Descriptive statistics
     - Deals with the methods for the organizing, summarizing and presenting numerical data in a convenient form (e.g. mean, variance)
   - Inferential statistics
     - Concerned with methods, procedures and protocols that assist us with making inferences about the whole population based on information contained in a sample (e.g. estimation, hypothesis testing, prediction)

3. Random variables
   - Discrete random variables
     - An assume only a finite number of different values
     - Discrete probability distribution
     - Binomial distribution
   - Continuous random variables
     - Can assume all the values in some interval
     - Normal distribution
     - Chi-square distribution
     - T-distribution
     - F-distribution

4. Sampling distribution
   - If the distribution of X is non-normal but n is large then $\overline{X}$ is approximately normally distributed. The approximation is good when n ≥ 30.

5. Estimators
   - Point estimator
     - A rule or formula which tells us how to use a set of sample observations to estimate the value of a parameter of interest
     - The value obtained after the observations have been substituted into the formula
   - Desirable properties
     - Unbiasedness $\mu = E(X)$
     - Efficiency
     - Consistency $\sigma^2 = E(X-\mu)^2$
     - Sufficiency $\overline{X}, \hat{\sigma}^2$

Key points:

1. **test statistic**

$$Z = \frac{\overline{X} - \mu}{\sigma/\sqrt{n}}$$

$$t - stat = \frac{b_k - \beta_k}{se(b_k)}$$

2. **Confidence interval (interval estimate)**

$$\overline{X} \pm Z\alpha/_2 \cdot \frac{\sigma}{\sqrt{n}}$$

$$b_k \pm t_{(1-\alpha/_2, N-K)} \cdot se(b_k)$$

- A range of values that gives us information about the location of a population parameter, and about the precision with which we estimate it

3. **Goodness-of-fit**

$$R^2 = 1 - \frac{SSE}{SST} = 1 - \frac{Sum\ of\ sqaured\ residual}{(S.D.dependent\ var)^2 \cdot (n-1)}$$

- R^2 measures the proportion of the variation in the dependent variable that is explained by the regression model
- For the non-linear relationship, the goodness-of-fit is computed by the generalized R^2:

$$R_g^2 = [Corr(y, \hat{y})]^2$$
$$= 0.912^2$$
$$= 0.8318$$

	PROD	PRODF
PROD	1.000000	0.912033
PRODF	0.912033	1.000000

4. **Hypothesis for $\boldsymbol{\beta = 0.5}$** (not 0)
   a. $H_0: \beta_2 = 0.5$
      $H_1: \beta_2 \neq 0.5$
   b. Reject H_0 if |t-stat| > |t-crit|
      Two-tail test: $t - crit = t_{(\alpha/_2, n-k)}$
      One-tail test: $t - crit = t_{(1-\alpha/_2, n-k)}$