

Econ 310 Final: Spring 2020

May 4, 2020

Answer the following questions to the best of your ability. Do not provide irrelevant information. If a question seems ambiguous to you, state the most reasonable assumptions to resolve the ambiguity and proceed on that basis. Show your work and explain your reasoning. You can use your notes, class handouts, and the textbook, but no other sources are allowed. Label clearly which question you are answering. There are 150 total points available. Good luck!

Equations for your reference:

- $s^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1} = \frac{(\sum_{i=1}^n x_i^2) - \frac{(\sum_{i=1}^n x_i)^2}{n}}{n-1}$
- $L_P = (n+1) \frac{P}{100}$
- $s_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{n-1} = \frac{(\sum_{i=1}^n x_i y_i) - \frac{(\sum_{i=1}^n x_i)(\sum_{i=1}^n y_i)}{n}}{n-1}$
- $b_1 = \frac{s_{xy}}{s_x^2}$, $b_0 = \bar{y} - b_1 \bar{x}$
- $r = \frac{s_{xy}}{s_x s_y}$
- $P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$
- $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
- $P(A_i|B) = \frac{P(A_i)P(B|A_i)}{P(A_1)P(B|A_1) + P(A_2)P(B|A_2) + \dots + P(A_k)P(B|A_k)}$
- $E(X) = \sum_x xP(x)$
- $V(X) = \sum_x (x - \mu)^2 P(x)$
- $COV(X, Y) = \sum (x - \mu_x)(y - \mu_y)P(x, y)$
- Binomial: $P(x) = C_x^n p^x (1-p)^{n-x}$
- $V(\hat{p}) = \frac{p(1-p)}{n}$
- Poisson: $P(x) = \frac{e^{-\mu} \mu^x}{x!}$

- Exponential:

$$\begin{aligned}
 - f(x) &= \lambda e^{-\lambda x} \\
 - P(X < x) &= 1 - e^{-\lambda x}
 \end{aligned}$$

- $V(\bar{X}_1 - \bar{X}_2) = \frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}$

- $V(\hat{p}_1 - \hat{p}_2) = \frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}$

- Finite population correction factor: $\sqrt{\frac{N-n}{N-1}}$

- $\tilde{p} = \frac{x+2}{n+4}$

- $\sigma_{\tilde{p}} = \sqrt{\frac{\tilde{p}(1-\tilde{p})}{n+4}}$

- $\mu_m = \mu$

- $\sigma_m = \frac{1.2533\sigma}{\sqrt{n}}$

- $t = \frac{\bar{x} - \mu}{(\frac{s}{\sqrt{n}})}$

- $F_{1-\alpha, \nu_1, \nu_2} = 1/F_{\alpha, \nu_2, \nu_1}$

- $\chi^2 = \frac{(n-1)s^2}{\sigma^2}$

- $s_p^2 = \frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1 + n_2 - 2}$

- Unequal variances: $\nu = \frac{(s_1^2/n_1 + s_2^2/n_2)^2}{\frac{(s_1^2/n_1)^2}{n_1-1} + \frac{(s_2^2/n_2)^2}{n_2-1}}$

- ANOVA:

$$- SST = \sum_{j=1}^k n_j (\bar{x}_j - \bar{\bar{x}})^2$$

$$- SSE = \sum_{j=1}^k \sum_{i=1}^{n_j} (x_{ij} - \bar{x}_j)^2$$

- $SSE = \sum_{i=1}^n (y_i - \hat{y}_i)^2 = (n-1)(s_y^2 - \frac{s_{xy}^2}{s_x^2})$

- $F = \frac{MSR}{MSE}$

- $s_\epsilon = \sqrt{\frac{SSE}{n-k-1}}$

- $s_{b_1} = \frac{s_\epsilon}{\sqrt{(n-1)s_x^2}}$

- Standard error of prediction interval: $s_\epsilon \sqrt{1 + \frac{1}{n} + \frac{(x_g - \bar{x})^2}{(n-1)s_x^2}}$

- Standard error of confidence interval: $s_\epsilon \sqrt{\frac{1}{n} + \frac{(x_g - \bar{x})^2}{(n-1)s_x^2}}$
- Test statistic for correlation coefficient: $r \sqrt{\frac{n-2}{1-r^2}}$
- Adjusted $R^2 = 1 - \frac{MSE}{s_y^2}$
- $d = \frac{\sum_{i=2}^n (e_i - e_{i-1})^2}{\sum_{i=1}^n e_i^2}$