

Eco 318

Test 1

Answer all three questions.

- 1.(i) Suppose Y is normally distributed with mean μ and variance σ^2 . Show that $\frac{Y-\mu}{\sigma}$ has mean 0 and variance 1 (i.e. $\frac{Y-\mu}{\sigma}$ follows a standard normal distribution, $N(0, 1)$).
- 1.(ii) Suppose Y is normally distributed with mean 10 and variance 4, find the probability of a random draw from the population that will fall within the interval between 8 and 14?
- (iii) Let $\{Y_1, \dots, Y_n\}$ be n random draws from Y . Derive $E(\bar{Y})$ and variance of \bar{Y} .
- (iv) Suppose $E(Y) = 10$ and $\text{var}(Y) = 4$. What is the probability that $\bar{Y} = \frac{1}{n} \sum_{i=1}^n Y_i$ will fall within the interval between 8 and 14 when $n = 25$?
2. Suppose in a region the unemployment rate for male is .10 and the unemployment rate for female is .20. The unemployment rate of those with college degree is .05 and those without college degree is .25. Suppose half of the labor force is male and half is female.
 - (a) What is the unemployment in the region?
 - (b) What is the percentage of labor force that is a college graduate.
 - (c) Can you derive the unemployment rate for male college graduate from the information given. Why or why not?
 - (d) Can you derive the employment rate for female graduate? Why or why not?
 - (e) What additional information you will need to derive answers to (c) and (d).
Do you think there is discrimination against female college graduate based on additional assumptions that (i) half of the college graduates are male and half are female; (ii) the unemployment rate for female college graduate is 6%?
Explain your answer.

3.(i) Are the following models linear regression models? Why or why not?

$$(a) Y_i = \beta_1 + \beta_2 \left(\frac{1}{X_i} \right) + u_i$$

$$(b) Y_i = \beta_1 + X_i^{\beta_2} + u_i$$

$$(c) Y_i = e^{(\beta_1 + \beta_2 X_i + u_i)}$$

$$(d) \log Y_i = \beta_1 + \beta_2 X_i + u_i$$

3.(ii) Suppose $Y_i = \beta_1 + \beta_2 X_i + u_i$. (a) Explain the meaning of u_i . What does u_i suppose to mean?

(b) Suppose $E(u | x) = 0$ and $\text{Var}(u | X) = s^2$. What is $E(Y | X)$? What is $\text{Var}(Y | X)$?

(iii) Let $(Y_i, X_i), i = 1, \dots, n$. Is the least squares regression line $\hat{Y}_i = \hat{\beta}_1 + \hat{\beta}_2 X_i$ and the least squares regression line $\hat{X}_i = \hat{c}_1 + c_2 Y_i$ based on the model $Y_i = \beta_1 + \beta_2 X_i + u_i$ and $X_i = c_1 + c_2 Y_i + v_i$ identical? Why or why not? Explain the role of the stochastic error term u_i or v_i in this regression analysis.