

YOUR NAME: _____

Section I (30 points) Questions 1-10 (3 points each)

Section II (40 points) Questions 11-14 (10 points each)

Section III (30 points) Questions 15-16 (15 points each)

Section I. Define or explain the following terms (3 points each)

Let W be a random variable from some distribution such that $E(W)=\gamma$, $\text{Var}(W)=\sigma^2$:

1. $\text{plim } \bar{W}$ (where \bar{W} is the sample mean drawn from the W -distribution)

2. the asymptotic distribution of \bar{W} (where \bar{W} is the sample mean again)

3. dummy variable trap--

4. probit-

5. LM test--

6. $\binom{n}{x}$, or "n choose x" (combination)--

7. instrumental variable estimator--

8. standardized beta coefficients--

9. $\text{plim } \left(\frac{\bar{W}}{\bar{Y}} \right)$ (where \bar{W} and \bar{Y} are sample means from W, Y distributions respectively)--

10. log-likelihood ratio test-

II. Some Fun Stuff: True, False or Uncertain Questions (11-13) and a consulting question (14)

11. T, F or U: “The constant in a regression is interpreted if and only if it is theoretically meaningful to the model that is being estimated.”

12. T,F or U: “For a quadratic specification, $y_i = \beta_0 + \beta_1 x_i + \beta_2 x_i^2 + \mu_i$, the slope of this equation equals $\hat{\beta}_1 + 2 * \hat{\beta}_2 * x + \hat{\beta}_2$, and the maximum is achieved only if $\hat{\beta}_2 > 0$.”

13. T, F, or U: “The variance of the prediction interval for a forecasted value of y , say y_p , from the model: $y_p = x_p \hat{\beta} + \mu_p$, is $\sigma^2(x_p (X'X)^{-1} x_p')$.”

14. Compare and contrast the least squares estimator with the maximum likelihood estimator:
a) verbally, what is the main difference in these two approaches to estimation?
b) which is easier to estimate (what do you mean by easier)?
c) Which is generally consistent?

III. Really Fun Stuff--Proofs

15. Prove that the linear probability model (dummy dependent variable regression model) is heteroskedastic (spell out the steps of your proof as completely as possible).

16. Prove that the least squares estimator of the variance, s^2 , is a consistent estimator of σ^2 in the linear model, $y = X\beta + \mu$, assuming that

$$\text{plim} \left(\frac{X'X}{n} \right) = \Omega, \text{ a positive definite, symmetric matrix}$$

and that the usual model assumptions apply. (Hint: $s^2 = \frac{\hat{\mu}'\hat{\mu}}{n-k}$ where $\hat{\mu}$ is the least squares residual vector, n is the sample size and k is the number of estimated coefficients (slope and intercept). Unless you can derive the variance for s^2 below, you cannot argue in this proof that the variance of s^2 goes to zero unless you can derive it and show that it does. So show consistency another way.)