

Second Exam: Economics 388, Econometrics Fall 2001 in R. Butler's course

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. central limit theorem-

2. maximum likelihood estimation

3. non-nested models-

4. probit-

5. score statistic-

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

7. instrumental variable estimator--

8. standardized beta coefficients--

9. asymptotically efficient--

10. treatment vs. control groups--

Some Fun Stuff: True, False or Uncertain Questions (11-12) and some regression questions (13 and 14). You are graded on your explanations for the True or False questions, and not on whether you listed T or F correctly....

11. a. 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."

b. T, F or U: "If in a regression including male and female lawyers (and non lawyers), You will get a dummy variable trap whenever you have dummy variable for lawyers, a dummy variable for males, and the interaction of the male and lawyer dummy variables (i.e., a "male*lawyer" interaction)."

12. a T,F or U: "To do a LM test of a restriction in the standard OLS model, you follow this procedure: 1) regress Y on the restricted (say "q" restrictions) set of regressors, then 2) take the residuals from step 1 and regress them on all of the regressors (including those restricted from the first stage), then 3) take n (the sample size) and multiply it by the adjusted R-square from the second regression. This last statistic (n*adj. R-square) will be distributed as chi-square distribution with q-degrees of freedom under the null hypothesis."

12. b. T, F or U: "A full test of racial differences in wage-models with nonwhites and whites is accomplished by adding a dummy variables for one of the races to the specification. Which dummy variable that is used, whether for whites or for nonwhites, does not matter. The inferences will be the same either way."

13. Derive the variance for a predicted value using matrix algebra (hint: you can take the following result as given: if $Y \sim N(\mu, \Omega)$ then $AY \sim N(A\mu, A\Omega A')$ where A is a matrix of constants).

14. Explain what the following regression code does, line by line, and what the output indicates, coefficient by coefficient (a_grade=1 if A for course, 0 otherwise; GPA=gpa before taking this course; TUCE_SCR=score of economic understanding at the beginning of the course, and PSI=cram course dummy variable =1 if you had the cram course, 0 otherwise).

regression code:

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ols a_grade gpa tuce_scr psi / predict=yhat
if (YHAT.GE.1) YHAT=.999
if (YHAT.LE.0) YHAT=.001
GENR WT = 1 / (YHAT*(1-YHAT))
OLS a_grade gpa tuce_scr psi / WEIGHT = WT

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output from the second regression:

VARIABLE	ESTIMATED	STANDARD	T-RATIO	PARTIAL	STANDARDIZED	ELASTICITY
NAME	COEFFICIENT	ERROR	28 DF	P-VALUE	CORR. COEFFICIENT	AT MEANS
GPA	0.39817	0.8783E-01	4.533	0.000	0.651	61.5418
TUCE_SCR	0.12156E-01	0.4542E-02	2.676	0.012	0.451	12.1109
PSI	0.38782	0.1052	3.687	0.001	0.572	0.4881
CONSTANT	-1.3087	0.2885	-4.536	0.000	-0.651	-73.1408

15. Coach has come up with a new estimator for the linear model: $y = X\beta + \mu$.

His estimator is

coach's estimator for $\beta = \hat{\beta} + \frac{1}{n} \bar{1}$ where $\hat{\beta}$ is the usual OLS estimator, n = sample size (the number of observations) and $\bar{1}$ is a "k by 1" vector of ones (and $\hat{\beta}$ is a "k by 1" vector).

a. Is his estimator (given the usual assumptions) unbiased? Prove it.

b. Is his estimator (given the usual assumptions) consistent? Prove it.

