

First Exam: Economics 388, Econometrics      Spring 2003 in R. Butler's class

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) Question 15

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

1. first quartile -

2. omitted variable bias-

3. null hypothesis vs. alternative hypothesis -

4. what the age coefficient in a wage regression estimates when there are other regressors -

5. F-test of a linear restriction -

6. linear vs. nonlinear model -

7. type I error -

8. Gauss-Markov theorem (BLUE theorem) -

9. adjusted R-squared -

10. probability significance values (i.e., 'p-values')-

## II. Some Concepts

11. Suppose that the joint distribution for random variables  $x$ ,  $y$  is given as

	Y random variable		
	10	20	30
X random variable			
10	.2	.1	.1
20	.3	.2	.1

A. calculate the marginal probability densities  $f(x)$  and  $f(y)$

B. Calculate  $E(x)$  and  $V(x)$  (no credit unless you show the right formulas).

C. Are  $x$  and  $y$  independent? Why or why not?

12. Indicate whether the following statement is True, False or Uncertain and explain why. You are graded only on your explanation for your answer.

a. "If the sample means of  $X$  and  $Y$  are zero in a simple regression model, then the estimated  $Y$ -intercept is zero."

b. "The residuals from a simple least squares regression are all zero."

13. Indicate whether the following statement is True, False or Uncertain and explain why. You are graded only on your explanation for your answer.

“Suppose wages are regressed on age in a simple regression model (wages are the dependent variable). Then changing the units of measurement of wages from dollars to cents will increase the intercept but not the slope; while changing the units of measurement of age from years to months will increase the slope but not the intercept.”

14. Suppose that the population model is the simplest regression model (note: this is not the simple regression model, this has no intercept):

$$Y_i = \beta_1 X_i + \mu_i$$

Use the orthogonality principle (or calculus) to derive the estimator for  $\beta_1$  in this model.

15. Prove that under the usual model assumptions that the least squares estimator,  $\hat{\beta}$ , is unbiased and has a covariance matrix equal to  $\sigma^2 (X'X)^{-1}$ .