Econometrics--Econ 388

Fall 2000, Richard Butler

Final Exam

your name_____

Section	Problem	Points Possible
I	1-20	3 points each
II	21	15 points
	22	5 points
	23	5 points
	24	5 points
	25	10 points
III	27	20 points
	28	20 points
IV	29	30 points
	30	30 points

I. Define or explain the following terms:

1. seasonal dummy variables-

2. type I and type II errors-

3. Goldfeld-Quandt test-

4. Durbin-Watson statistic-

5. probit regression model -

6. instrumental variables-

7. structural vs. reduced form equations-

8. two stage least squares-

9. unit root process-

10. omitted variable bias-

11. idempotent matrix-

12. p-value-

13. R^2-

14. endogenous vs exogenous variables-

15. strict stationary process-

16. dynamically complete models-

17. feasible generalized least squares--

18. Hausman test-

19.plim--

20. central limit theorem -

II. Some Concepts

21. Let $x_1, x_2, x_3, ..., x_n$ be a sample of size n from a normal distribution $N(\mu,\sigma^2)$. Consider the following point estimators of μ:

$\mu_1 = \bar{x}$, the sample mean

$\mu_2 = x_1$ (this second estimator for the population mean equals the value of the first sample point)

$$\mu_3 = \frac{x_1}{2} + \frac{1}{2(n-1)}(x_2 + x_3 + x_4 + ... + x_n)$$

a) Which of these are unbiased?
b) Which of these are consistent? (huge hint: they will be consistent if their bias and their variance go to zero as n, the sample size, gets large).
c) Which of these are relatively most efficient in the sense of having the smallest variance?

22. What do the following Shazam programs do:

a. 2SLS M N K L (K L J)
   2SLS N M J (K L J)

b.
```
OLS Y X1 X2 / RESID=E
GENR ESQ = E*E
GENR X1SQ = X1*X1
GENR X1SQ = X2*X2
GENR X1X2 = X1*X2
OLS E2 X1 X2 X1SQ X2SQ X1X2
GEN1 LM = $N*$R2
PRINT LM
```

c. What restrictions are imposed on the (slope) coefficients in this model

$$Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \varepsilon$$

by the following Shazam code:

```
GENR Y_X3 = Y - X3
GENR X1X2 = X1 + X2
OLS Y_X3 X1X2
```

23. Explain why the following is true, false, or sometimes true:
a. "In a simultaneous equation system, the more the number of exogenous variables the better."

24. If you wanted to estimate the slope regressor, β_1, in the simple regression model

$$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i$$

you might decide just to average successive differences in the rise over the run as follows:

$$\overline{\beta} = \frac{1}{n-1} \sum_{i=2}^{n} \frac{Y_i - Y_{i-1}}{X_i - X_{i-1}}$$

where Y_{i-1} means the value of Y from the previous observation (so that $Y_{i-1} = \beta_0 + \beta_1 X_{i-1} + \varepsilon_{i-1}$). Show whether $\overline{\beta}$ is an unbiased estimator of β_1 or not.

25. True or False again: "A first order autoregressive process, $y_t = \rho\, y_{t-1} + \mu_t$, is both stationary and weakly dependent if ρ <1."

III. Some Applications

26. From the assumptions of the Classical linear regression model (state them yourselves), derive the sampling distribution for the following for cross section data:

a. the sampling distribution for $\boldsymbol{\beta}$, the lease squares coefficient vector, and

b. the sampling distribution of Y_T, a forecast value of y given a specific value of the regressor vector, X_T (i.e., $Y_T = X_T\boldsymbol{\beta}$).

27. Explain what a dummy variable is, and the different contexts in which it is used in econometrics and how it is used.

IV. A Few Results

28. Prove that s^2, the estimator of the variance of μ_i (where μ_i is the error term in the classical regression model), is unbiased using matrix algebra.

29. Prove the Gauss-Markov theorem (that OLS estimators are BLUE)