Econometrics--Econ 388

Winter 2002, Richard Butler

Final Exam

your name____

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

I. Define or explain the following terms:

1. symmetric matrix-

2. Cochrane-Orcutt estimation-

3. dummy variable trap -

4. consistency (of an estimator)-

5. adjusted R^2 -

6. probability density function-

7. random variable-

8. Method of Moment estimator-

9. estimate vs. estimator-

10. logit estimation-

11. zero conditional mean assumption (of error term)-

12. law of large numbers-

13. heteroskedasticity robust standard error-

14. first order autocorrelation-

15. weakly dependent -

16. standardized beta coefficient-

17. prediction interval (forecasting a point)-

18. $\sum_{i=1}^{6} X_i$ -

19.formula for a Chow test comparing residuals of a restricted model (SSR^r, df^r) with the residuals for the unrestricted model (SSR^u, df^u)--

20. t-ratio formula (for a $\hat{\beta}_i$)-

II. Some Concepts

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

$$f(x,y) = .6^{x}\ .4^{1-x}\ .3^{y}\ .52^{1-y}\ 2^{xy}$$

for values x=0, 1 and y=0, 1.

A. What are the joint probabilities f(x=0,y=0), f(x=0,y=1), f(x=1,y=0), and f(x=1,y=1)?

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

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

D. Calculate the conditional probability density f(y|x=0) (again, no credit unless you show the right formulas)

E. Are x and y independent? Why or why not?

The next four questions consist of statements that are True, False, or Uncertain (Sometimes True). You are graded solely on the basis of your explanation in your answer

22. “Auxillary tests in LM tests are run to determine the beta coefficients.”

23. "In a simultaneous equation system, the more the number of exogenous variables the better."

24. "A random walk is stationary but not weakly dependent.”

25. “In maximum likelihood estimation, the log likelihood function is maximized by choosing the best sample.”

III. Some Applications

26. Suppose that you get the following results for whites and blacks in a random sample of full time workers (other race groups are omitted from the sample), when annual wage and salary income is regressed on

M=dummy variable is 1 for males
C=dummy variable is 1 for whites

wage = 23,000 + 12,000 M + 3,700 C + 1200 M*C

If all the coefficients are statistically significant, what can you say about the relative wages of white males, white females, black males, and black females?

27. For the linear, $Y = X\beta + \mu$, derive the least squares estimator, $\hat{\beta}$, (using matrix algebra) from the geometrical insight that the residuals are orthogonal to the regressors: $X'\mu = 0$.

28. Assume that under the usual model assumptions, $\hat{\beta}_1$ is a consistent estimator for the slope coefficient in the simple regression model. Prove the $\hat{\beta}_0 = \bar{y} - \hat{\beta}_1 \bar{x}$, the OLS estimator for the intercept coefficient, is also consistent. (where $\bar{y}, \bar{x}$ are the sample means of the dependent and independent variables respectively).

III. Some More Fun Stuff

29. A. Structural Representation (Based on Theory)

Demand: $W_i = \beta_1 H_i + \beta_0 + \varepsilon_i$

Supply: $H_i = \alpha_1 W_i + \alpha_0 + \alpha_2 O_i + \mu_i$

with theoretical expectations $\beta_1 < 0$, $\alpha_1 > 0$, $\alpha_2 < 0$

where W, H, and O denote wage rate, hours worked, and other (non-wage) income. ε_i, μ_i are the errors in the respective demand and supply equations.

A. Are the coefficients α_1, β_1 both identified? Why or why not?

B. If there is an identified equation, write out the Shazam command that would get consistent estimates for the identified model(s).

30. For the model $Y = X\beta + \mu$, errors that are heteroskedastic or serially correlated can be transformed by a T matrix (one T transformation for heteroskedasticity, another T transformation for serially correlation) such that "T μ " now has the 'nice' properities again.

A. What is that T transformation when the error term is AR(1): $\mu_t = \rho\, \mu_{t-1} + \varepsilon_t$ where ε_t is a white noise error term (independent with zero mean and constant variance).

B. What is that T transformation for heteroskedasticity?

C. When is the transformation necessary (useful)?

D. What is the intuition behind the transformations?