Econometrics--Econ 388

Fall 2004, Richard Butler

Final Exam

your name____

Section	Problem	Points Possible
I	1-20	3 points each
II	21	15 points
	22	15 points
	23	5 points
	24	5 points
	25	15 points
	26	5 points
III	27	30 points
IV	28	30 points
	29	20 points

I. Define or explain the following terms:

1. For the linear regression model, $\hat{y} = X\hat{\beta}$ and $\hat{\mu}$ are uncorrelated--

2. dummy variable trap-

3. LaGrange-Multiplier test-

4. logistic regression model-

5. “boundedness” problem in the probability model -

6. method of moment estimators -

7. structural vs. reduced form equations-

8. asymptotic efficiency-

9. law of large numbers-

10. type II error -
11. central limit theorem-

12. p-value-

13. maximum likelihood estimation criterion-

14. F-test (or "Chow" test)-

15. Breusch-Pagan test-

16. dynamically complete models-

17. adjusted R-square -

18. perfect multicollinearity -

19.plim--

20. Durbin-Watson test-

II. Some Concepts

21. Probability Theory: Let the joint distribution for random variables W and V be given by the cell entries in the following table:

	W=0	W=1	W=2
U=0	.1	0	.2
U=1	.1	.1	.1
U=2	.05	.15	.2

a) compute the marginal density functions f(W) and f(U)

b) find the expected values, E(W) and E(U).

c) What is the conditional distribution of U given W=1? What is the conditional distribution of of W given that U>0 (i.e, f(W|U>0)) ?

d) What is the conditional mean, E(W|U>0)?

e) What is the covariance of W, U?

22. Write Shazam programs to make the following tests or estimate the following models requested below, assuming that the sample variables A and B are endogeneous, and that the exogeneous variables are C, D, E, and F.

a. $A_i = \beta_0 + \beta_1 B_i + \beta_2 C_i + \beta_3 D_i + \mu_i$ Do a Hausman test for endogeneity of B on the right hand side of the equation.

b. For the same model as in (a), write out the Shazam code to test for overidentifying restrictions on the "extra" identifying variables, E and F.

c. For the same model as in (a), write out the Shazam code to estimate the model in (a) by two stage least squares.

23. Explain why the following is true, false, or sometimes true:

a. "Suppose that a regression of consumption expenditures (C) is regressed on income (I) with the following results

$$C_i = 100,000 + .6 \ I_i + \hat{\mu}_i$$

using yearly observations quoted in 1980 dollars. Suppose the figures were rescaled to 1998 dollars by multiplying the data by .66667. The new regression (with the rescaled data) would be

$$C_i = 150,000 + .4 \ I_i + \hat{\mu}_i \ ."$$

24. "Y is orthogonally projected onto the X-space (a space generated by a linear combination of the Xs) by a matrix that is idempotent and symmetric."

25. “The Butler estimator for the linear model, $Y = X\beta + \mu$, is as follows

Butler estimator $\equiv \breve{\beta} = (X'X)^{-1}X'Y + \frac{3.1417}{n}$ where n=sample size, and X and Y are the matrices of the independent and dependent variables respectively (and the usual assumptions hold). True or False: Butler’s estimator is consistent and unbiased.”

26. "A moving average process of order two, MA(2), is stationary and weakly dependent."

III. Some Proofs.

27. Suppose that the population model is $y_i = \beta x_i + \mu_i$ where μ_i is distributed as a normal random variable with a mean of zero and a variance of σ^2. Also assume that the population errors are uncorrelated (independent). (Note this is a model without an intercept—leave it that way, i.e., it only has one slope regressor.)

a) Use the orthogonal condition (or calculus) to find the least square estimator for β .

b) Determine whether this estimator is unbiased or not.

c) Derive the variance for this estimator (i.e., the variance for $\hat{\beta}$).

d) From the Gauss Markov theorem, what can we say about our least square estimator, $\hat{\beta}$?

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. Derive and discuss the omitted variable bias when the true model is

$$Y = X\beta + z\gamma + \mu$$

when X is the usual data matrix, and z is the omitted variable. That is, what is the bias resulting from applying OLS using the Xs alone.