Econometrics--Econ 388

Spring 2001, 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	26	20 points
	27	20 points
IV	28	30 points
	29	30 points

I. Define or explain the following terms:

1. law of large numbers-

2. confidence interval-

3. LaGrange-multiplier tests-

4. AR(3) process-

5. population vs. sample regression model -

6. asymptotically efficient-

7. structural vs. reduced form equations-

8. non-nested models-

9. unit root process-

10. t-test-

11. idempotent matrix-

12. Gauss-Markov Theorem (BLUE)-

13. adjusted R^2-

14. interaction effects-

15. unbiased estimator-

16. dynamically complete models-

17. integrated of order one, I(1)--

18. Hausman test-

19.identification in economic models--

20. prediction intervals-

II. Some Concepts

21. **Shazam code** a. Consider a model where the return to human capital depends on educational attainment (EDUC) and job experience (EXPER), and the interaction of job experience and education (EDUC_EXP):

$$\text{LNWAGE} = \beta_0 + \beta_1 \text{ EDUC} + \beta_2 \text{ EXPER} + \beta_3 \text{ EDUC\_EXP} + \mu$$

Write the Shazam code that will produce the confidence interval for the return to schooling for someone with 15 years of job experience.

b. If MARR is a dummy variable for marriage, AGE is the student's age, and FEMALE is a dummy variable for gender, write the Shazam program that we estimate the linear probability model where the probability of being married depends only on AGE and FEMALE, correcting for heteroskedasticity:

c. Suppose that the model of supply and demand horses were given as:

demand: $H_i = \beta_0 + \beta_1 P_i + \beta_2 L_i + \beta_3 I_i + \varepsilon_i$

supply: $H_i = \alpha_0 + \alpha_1 P_i + \alpha_2 F_i + \mu_i$

H_i = number of horses
P_i = price of a horse
L_i = number of llamas
I_i = household income
F_i = cost of horse feed

Write the Shazam code necessary to consistently estimate the parameters of the supply equation given above.

d. Assume that you can estimate the demand for horses (in part c above) with ordinary least squares regression, including the code necessary to also test for the joint significance of number of llamas and household income (in the demand specification):

Explain why the following quotations are true, false, or sometimes true:
22-23. In a correctly specified model for the Provo housing market, the price of a house is related to number of bedrooms and square footage as follows.

PRICE=10,000 + 130,000 BEDROOMS + 50 SQUARE-FOOTAGE

22. "Joseph Young paid $250,000 for a house with 4 bedrooms and 2000 square feet; he got a great bargain."

23. "Suppose that model for housing price is given as above, but that square-footage data is not available. Then the coefficient for number of BEDROOMS will be biased towards zero as long as SQUARE-FOOTAGE and BEDROOMS are positively correlated."

24. "To measure the effect of tax revenue mix on employment growth, employment growth (GRWTH) is regressed on an intercept, a human capital index variable (HK), a physical capital stock variable (PK), and shares of sources of tax revenue: P (share of tax revenue from property taxes), I (share of tax revenue from income taxes), and S (share of tax revenue from sales taxes):
GRWTH = β_0 + β_1 HK + β_2 PK + β_3 P + β_1 I + β_2 S + μ
Leaving out the share of tax revenue that comes from all other of taxes (say F, from fees and miscellaneous taxes) will cause the estimated coefficients of the remaining shares (P, I, and S) to be biased towards zero."

25. Suppose for that another housing market (not Provo), the correct econometric specification is

PRICE=5,000 + 50,000 BEDROOMS -5,000 BEDROOMS-SQ + 50 SQ-FOOTAGE

(where the square of the number of bedrooms, BEDROOMS-SQ, is now included as a regressor). "This indicates that, from the builder's point of view, it is optimal to build a home with four bedrooms."

III. Some Applications

26. Prove the following result (assume that linear combinations of normal variables are also normal):

"If y is distributed $N(\mu_y,\Sigma_y)$, then Ay is distributed $N(A\mu_y; A\Sigma_y A')$ where A is a matrix of constants."

27. Let $\{e_t : t =, -1, 0, 1, 2, \ldots\}$ be a sequence of independent, identically distributed random variables with mean zero and variance σ^2. Define a stochastic process by

$$y_t = e_t - (1/2)e_{t-1} + (1/4)e_{t-2} \quad \text{for } t = 1, 2, 3, \ldots.$$

a) find the mean, variance, and covariances (find covariances for Cov(y_t, y_{t-h}) for h=1,2,3 and 4) for the process y_t.
b) Is this process stationary? explain
c) Is this process weakly dependent? explain

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. a) Explain what consistency of an estimator means.
b) Prove that the OLS estimator is a consistent estimator of β , for the linear model

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

making whatever assumptions are necessary for your proof.