Second Exam: Economics 388, Econometrics Spring 2006 in R. Butler's section

YOUR NAME:____

Section I (30 points) Questions 1-10 (3 points each)
Section II (20 points) Questions 11-12 (10 points each)
Section III (50 points) Questions 13-14 (15 points each)
Question 15 (20 points)

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

1. LaGrange-Multiplier test-

2. oblique vs. orthogonal projections--

3. law of large numbers--

4. central limit theorem--

5. female dummy variable coefficient in a wage equation--

6. marginal effect from a logit regression (i.e, how to get $\frac{\partial \Pr(Y_i = 1)}{\partial X_{i,j}}$)-

7. standardized beta coefficients--

8. instrumental variables --

9. F-statistic formula and what large values indicate-

10. proof that the linear probability model is heteroskedastic-

II. Some Fun Stuff:

11. True, False or Uncertain question: you are graded on your explanation and not on whether you guessed T or F correctly. "For the model $Y = X_1\beta_1 + X_2\beta_2 + \mu$, where the X_1 matrix consists of dummy variables for each number of the panel data set (so called "fixed effects"), we obtain an extraneous estimator of the fixed effects coefficient β_1, call it $\tilde{\beta}_1$, and decide to regress $Y - X_1\tilde{\beta}_1$ on X_2, then the resulting OLS estimate of β_2 will be unbiased."

12. Suppose that you have quarterly data from several years from Hotel Delta, the infamous rabbit hunting lodge. The quarterly variable value ("quarter")is 1 for winter, 2 for spring, 3 for summer, 4 for autumn, and . if the quarter is missing (i.e., the standard missing value notation for numeric data in SAS and Stata). Write out the appropriate code testing for quarterly variation in the dependent variable guests ("guests"), including the creation of whatever dummy variables are necessary, including accounting for missing information on season. (Be sure to spell out the names of your variables clearly so we cannot possibly misunderstand what you've done.)

III. Really Fun Stuff

13. In the linear regression model

$$wage_i = \beta_0 + \beta_1 educ_i + \beta_2 age_i + \beta_3 female_i + \mu_i$$

where μ_i is the error term with the usual OLS ideal properties assumed to hold, the coefficients are known for this sample to be related to a more basic economic parameter α according to the following equations

$$\beta_1 + \beta_2 = \alpha \quad \text{and} \quad \beta_1 + \beta_3 = -\alpha$$

Write the SAS code or STATA code that estimates α and the standard error of $\hat{\alpha}$. (Be sure to explain what your code is supposed to be doing and where that estimate of α and the standard error of $\hat{\alpha}$ are).

14. For the heteroskedasticity model (and more generally, the generalized least squares):

$$Y = X\beta + \mu \quad \text{where} \quad \mu \sim N(0, \Sigma)$$

the generalized least squares (weighted least squares) estimator is

$$\hat{\beta}_{GLS} = (X'\Sigma^{-1}X)^{-1}X'\Sigma^{-1}Y$$

prove that it is the best (minimum variance in the matrix sense), linear, unbiased estimator among the class of all linear, unbiased estimators for this model (it is the case, and you may assume that for any *nxk* matrix *N*, the matrix is $N'\Sigma N$ positive definitive).

15. For the general linear regression model, $y = X\beta + \mu$, assume that the modeling assumptions are all satisfied. Further, assume that $\text{plim}\left(\frac{X'X}{n}\right) = \Omega$, a positive definite, symmetric matrix for any size n. Then show that the OLS estimators for the linear regression model are consistent.