Econ 120C **Ramu Ramanathan**
Spring 1998 **Second Midterm (30%)**

Your name (please print it) _____

Your Student Id. (NOT Soc. Sec. no.)_____

DO NOT TURN THE PAGE UNTIL EVERYONE HAS RECEIVED THE EXAM AND YOU ARE GIVEN THE SIGNAL TO START. ALSO, YOU MUST STOP WRITING WHEN YOU ARE ASKED TO DO SO (YOU WILL BE GIVEN A 2 MINUTE WARNING). TEN POINTS WILL BE DEDUCTED FOR EACH MINUTE OF EXTRA TIME IT TAKES YOU TO STOP WRITING.

If you use a pencil, you forfeit the right to complain about grading UNLESS YOU PICK UP THE EXAM FROM THE TA FROM HIS/HER OFFICE AND LOOK AT THE GRADING BEFORE LEAVING THE OFFICE.

Make sure that all pages (1 through 5) are there. Read the questions carefully and make sure that you do not misunderstand them. If you get stuck somewhere, don't waste time but move on.

I CONSIDER CHEATING AS A VERY SERIOUS MATTER AND WILL GIVE AN F IN THE COURSE TO ANY ONE CHEATING AND ALSO REFER HIM/HER TO THE DEAN FOR DISCIPLINARY ACTION.

MAXIMUM NUMBER OF POINTS = 40 + 30 = 70

I. Consider the following model of women's labor force participation rates.

$$WLFP_t = \beta_1 + \beta_2 EDUC_t + \beta_3 UE_t + \beta_4 DR_t + \beta_5 URB_t + \beta_6 WH_t + u_t$$

where WLFP = persons 16 years & over--percent in labor force who are female, EDUC = females 25 years & over--percent high school graduate or higher, UE = civilian labor force--percent unemployed, DR = female population 15 & over--percent who are divorced, URB = percent of population living in urban areas, and WH = female population--percent 16 years and over who are white. The above model was estimated using data for the 50 States. In order to test for heteroscedasticity, the following auxiliary regression was estimated for the error variance (usq is $\hat{u}_t^2$).

OLS ESTIMATES USING THE 50 OBSERVATIONS 1-50
Dependent variable - usq

VARIABLE	COEFFICIENT	STDERROR
constant	105.356	26.4865
EDUC	-0.272777	0.141964
UE	-6.18299	4.06482
DR	-5.33222	3.57858
URB	-0.88329	0.387749
WH	-1.00973	0.516467
UE^2	0.556926	0.301954
DR^2	0.306493	0.173236
URB^2	0.00721319	0.00293523
WH^2	0.0111166	0.0043525

Error Sum of Squares (ESS) 888.498
Total sum of squares (TSS) 1725.330

I.1 (5 points)
Write down, using symbols rather than numerical values, the auxiliary equation for error variance implied by the above estimates.

I.2 (5 points)
Write down the null hypothesis for homoscedasticity (that is, no heteroscedasticity).

I.3 (3 points)
Compute the numerical value of the test statistic (show your derivations).

I.4 (5 points)
State its distribution under the null including the d.f.

I.5 (5 points)
Write down the critical value (at the 1 percent level) for the test and state whether the null hypothesis is rejected or not. Does this mean that there is a significant heteroscedasticity? Why or why not?

I.6 (5 points)
Based on your test what can you say about the OLS estimators of the model, particularly about unbiasedness, consistency, efficiency, and the reliability of hypothesis tests?

I.7 (13 points)
Regardless of your answer in I.5, assume that there was significant heteroscedasticity. Describe step by step how the above auxiliary equation can be used to obtain Weighted Least Squares of the βs (assume that you don't face the negative variance problem). Your answer should not be in

general symbolic terms copied from the index card but very specific to the numerical values in the above table and the variables in the model. Give detailed instructions that demonstrate that you really understand how the procedure works. Not providing enough details or providing irrelevant answers can lose you points. ESL COMMANDS ARE NOT ACCEPTABLE BECAUSE THEY DO NOT DEMONSTRATE THAT YOU REALLY UNDERSTAND HOW THE PROCEDURE IS IMPLEMENTED.

II.

Consider the following double-log model of the demand for ice cream.

$$LD_t = \beta_1 + \beta_2 LY_t + \beta_3 LP_t + \beta_4 LT_t + u_t$$

where L denotes logs, D is demand, Y is income, P is price, and T is temperature. In order to test for higher order serial correlation, the following auxiliary regression was estimated, where ut = $\hat{u}_t$, ut1 = $\hat{u}_{t-1}$, ut2 = uhat$_{t-2}$, and ut3 = $\hat{u}_{t-3}$.

OLS ESTIMATES USING THE 27 OBSERVATIONS 4-30
Dependent variable - ut

VARIABLE	COEFFICIENT	STDERROR	T STAT	PROB t > |T|
0) constant	-0.51069	1.515891	-0.336891	0.739709
10) ut1	0.552587	0.246655	2.240318	0.036585 **
11) ut2	-0.204653	0.297275	-0.688429	0.499091
12) ut3	-0.064952	0.290782	-0.223372	0.825512
6) LY	0.140065	0.285781	0.490114	0.629387
7) LP	0.142403	0.632046	0.225304	0.824029

```
  8) LT                 0.017987          0.081584    0.220473    0.827738

Error Sum of Sq (ESS)      0.17808     Std Err of Resid. (sgmahat)    0.094361
Unadjusted R-squared         0.233     Adjusted R-squared                0.003
Durbin-Watson Stat.       1.883646     First-order auto corr coeff      -0.049
```

II.1 (5 points) Write down the auxiliary equation for the error term implied by the above equation.

II.2 (3 points) Write down the null hypothesis for no autocorrelation. _____

II.3 (3 points) Write down the numerical value of the test statistic.

II.4 (3 points) Write down its distribution and d.f. _____

II.5. (3 points) Write down the critical value for a 10 percent test. _____

II.6 (3 points) State the decision rule and the conclusion.

II.7 (4 points) Based on your conclusion, are OLS estimates of the parameters of the model,

unbiased? _____ **consistent? _____**

efficient? _____ **are tests valid? _____**

II.8 (5 points) Explain the reasons for your answers in II.7.