Econ 120B **Ramu Ramanathan**
Spring 1998 **First Midterm (20%)**

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.

IN THE HYPOTHESIS TESTING PARTS, DON'T ASK ME WHETHER THE TEST IS ONE-SIDED OR TWO-SIDED. YOU HAVE TO FIGURE THAT OUT FOR YOURSELF FROM THE INFORMATION PROVIDED.

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 = 70

I.

In the simple regression model $Y_t = \alpha + \beta X_t + u_t$, are the following statements correct? Fully explain why or why not?

I.1 (7 points)

If the X-values have a small sample variance, then OLS estimators $\hat{\alpha}$ and $\hat{\beta}$ will be less precisely estimated.

I.2 (8 points)

If the errors u_t are serially correlated or heteroscedastic, then OLS estimators $\hat{\alpha}$ and $\hat{\beta}$ will still be unbiased and consistent, but not efficient.

II. Suppose you specified the regression model as $Y_t = \beta X_t + u_t$ and estimated β as $\hat{\beta} = [\Sigma (X_t Y_t)] / [\Sigma (X_t^2)]$. However, the true model has a constant term so that Y_t is actually given by $Y_t = \alpha + \beta X_t + u_t$, where u_t has zero expectation, X is given, and $\alpha \neq 0$.

II.1 (12 points)
Carefully derive the true expected value of $\hat{\beta}$ and show that it is biased.

II.2 (4 points)
Derive the condition under which $\hat{\beta}$ will be unbiased (it should not be $\alpha = 0$).

II.3 (4 points) What is the intuitive interpretation of the condition you just derived?

III.
Consider the simple regression model $Y_t = \alpha + \beta X_t + u_t$ in which Y_t is total expenditure on travel and X_t is total income for the t^{th} State. Including the District of Columbia, you have data for 51 observations. Both variables are measured in billions of dollars. The following is a partial computer output for the above data.

VARIABLE	COEFFICIENT	STDERROR
constant	0.49812	0.535515
income	0.055573	0.003293

Error Sum of Sq (ESS)	417.110335
Total sum of Squares (TSS)	2841.33048859

III.1 (5 points)
What is the econometric interpretation of the estimated coefficient for income? Does the numerical value appear reasonable?

III.2 (14 points)
Test individually whether the coefficients for the constant term and income are significantly different from zero at the 5% level. Be sure to state the null and alternative hypotheses, the test statistic and its distribution, the critical value (or range), and the criterion. What is your conclusion?

III.3 (3 points)
Compute the measure of goodness of fit.

III.4 (5 points)
Test the model for goodness of fit at the 1 percent level of significance. Show all your derivations. What is your conclusion?

III.5 (8 points)
Suppose the data on X and Y are converted to thousands and a new model is estimated as $Y^* = \alpha^* + \beta^* X^* + u^*$, where the variables with asterisks are the transformed ones. In the table below, fill in the blanks, indicated by underlined items, that give the values for the transformed model. Show your derivations.

VARIABLE	COEFFICIENT	STDERROR
constant	_____	_____
income*	_____	_____
Error Sum of Sq (ESS*)		_____
Total sum of Squares (TSS*)		_____