Econ 120B **Ramu Ramanathan**
Spring 2003 **Final Exam (35%)**

Maximum number of points = 80

Your name (please print it) _____

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

Because you have plenty of time to answer questions, I expect you to explain and justify each step and not skimp on details. Read each question carefully.

Using quarterly data for 10 years (40 observations), the following double-log model (Model A) was estimated:

(A) $$\text{LPCCARS} = a + b\ \text{LPRICE} + g\ \text{LPCINCOME} + d\ \text{LINTRATE} + u$$

where PCCARS is per-capita new car sales, PRICE is new-car price index, PCINCOME is per-capita income, and INTRATE is the prime interest rate. The prefix L for each variable denotes the logarithm. The estimated coefficients and associated statistics are in the following table. (*Note: Values in parentheses are t-statistics.)* In addition, three seasonal dummies have been defined—SPRING, SUMMER, and FALL—each of which takes the value 1 in the corresponding quarter and 0 otherwise. In Model B these seasonal dummies have been included and in Model C only the SPRING dummy variable is present.

Variable	Model A	Model B	Model C
CONSTANT	- 31.852	- 33.320	- 32.582
	(- 5.8)	(- 7.6)	(- 7.4)
LPRICE	- 1.751	- 1.774	- 1.760
	(- 7.6)	(- 9.8)	(- 9.6)
LPCINCOME	4.732	4.907	4.814
	(6.7)	(8.8)	(8.5)
LINTRATE	- 0.193	- 0.197	- 0.196
	(- 3.3)	(- 4.3)	(- 4.2)
SPRING		0.092	0.125
		(2.8)	(4.6)
SUMMER		- 0.051	
		(- 1.6)	
FALL		- 0.049	
		(- 1.5)	

Model Selection Statistics

ESS	**0.31044**	**0.17699**	**0.19341**
SGMASQ	**0.8626**	**0.5363**	**0.5526**
AIC	**0.9482**	**0.6279**	**0.6209**
FPE	**0.9488**	**0.6302**	**0.6217**
HQ	**1.0079**	**0.6987**	**0.6701**
SCHWARZ	**1.1226**	**0.8438**	**0.7668**
SHIBATA	**0.9316**	**0.5973**	**0.6644**
GCV	**0.9584**	**0.6501**	**0.6316**
RICE	**0.9704**	**0.6807**	**0.6447**

1. **(2 points) What is the control season? _____**

2. **(18 points) <u>In Model B</u>, state the expected signs for each coefficient (exclude the constant term) and your reasons for expecting them. Are any of the observed signs "wrong" or do they agree with your intuition ?**

LPRICE

LPCINCOME

LINTRATE

SPRING

SUMMER

FALL

3. **(5 points) <u>In Model C</u>, test the null hypothesis that the price elasticity of demand for new cars is numerically equal to 1 against the alternative that demand is either price elastic or inelastic (ignore the sign of the coefficient) . Use a 1% level, show all your steps, and state you conclusion as to whether demand is price elastic or not.**

You want to test the null hypothesis that there is no seasonal difference in the constant term across seasons. (*Note: only the constant term difference is tested here.*)

4. **(3 points) Write down another econometric model (in symbolic terms with no numerical values but only *b* 's) that will enable you to test this hypothesis. This will be the unrestricted model (U). *[Choose winter as the control season.]***

5. **(2 points) In the model you just derived, state the null and alternative hypotheses that will make Model A the restricted model.**

6. **(3 points) With the values given in the above table compute the test statistic.**

7. **(3 points) Under the null hypothesis, what is its distribution and the numerical value of the degrees of freedom?**

8. **(4 points) Actually carry out the test at the 1 percent level. What do you conclude about seasonal differences in the constant term?**

9. **(10 points) Perform appropriate tests to decide which variables of Model B you think should be dropped. Explain fully your methodology for doing these tests and your rationale for omitting one or more variables.**

10. **(5 points) Which would you choose as the "best" model and why?**

11. **(10 points)You want to test whether the price elasticity (*b*) is different across seasons. *Starting from Model B,* derive another model that will enable you to test for this. This model must be written in the standard form of a regression model with a dependent variable related to a constant plus a number of *b*'s multiplied by variables. Show your derivations.**

12. (3 points) Write down the null hypothesis — in your model in question 11 — to test the hypothesis "there is no seasonal difference in the price elasticity."

13. (12 points) Describe step-by-step how you would carry out this test using the Lagrange Multiplier (LM) test. (*Note: You cannot actually carry out this test because there is not enough information*.) In particular, state what new variables must be created, which regressions should be run, how to compute the test statistic, its distribution and d.f. under the null, and the decision rule at 1% level. Note that, wherever feasible, numerical values must be provided.