

Econ 120C  
Fall 1998

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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 7) 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 = 50 + 15 = 65**

**I.**

October 19, 1998 issue of Business Week has rated the top 25 Business Schools in the U.S.. The available data are the following:

<b>gain</b>	=	<b>PostMBA salary – preMBA salary</b>
<b>tuition</b>	=	<b>Tuition in thousands of dollars</b>
<b>bwrank</b>	=	<b>Business Week’s rating from 1 (highest) to 25</b>
<b>z1</b>	=	<b>Recruiters’ rating of MBA skills as analysts</b>
<b>z2</b>	=	<b>Recruiters’ rating of MBA skills as team players</b>
<b>z3</b>	=	<b>Recruiters’ rating of MBA skills as having a global view</b>
<b>z4</b>	=	<b>MBA’s rating of teaching</b>
<b>z5</b>	=	<b>MBA’s rating of the curriculum</b>
<b>z6</b>	=	<b>MBA’s rating of placement</b>

Ratings are measured from 1 to 4, 4 being the best. Consider the basic model

$$\text{gain} = \beta_1 + \beta_2 \text{tuition} + \beta_3 \text{bwrank} + \beta_4 z1 + \dots + \beta_9 z6 + u_t$$

To test whether the squares of the independent variables (except the constant) should be added to the model, the following auxiliary regression was estimated (for the LM test). The numbers in parentheses are the p-values.

$$\begin{aligned} \hat{u}_t = & -42.784 - 5.467 \text{tuition} + 1.624 \text{bwrank} + 4.345 z1 - 14.962 z2 + 43.041 z3 \\ & (0.693) \quad (0.360) \quad (0.221) \quad (0.815) \quad (0.999) \quad (0.999) \\ & + 65.015 z4 - 17.906 z5 - 22.879 z6 + 0.140 \text{tuition}^2 - 0.045 \text{bwrank}^2 \\ & (0.016) \quad (0.140) \quad (0.478) \quad (0.322) \quad (0.325) \\ & - 1.684 z1^2 + 2.469 z2^2 - 5.693 z3^2 - 11.182 z4^2 + 3.582 z5^2 + 3.623 z6^2 \\ & (0.557) \quad (0.999) \quad (0.999) \quad (0.013) \quad (0.102) \quad (0.475) \end{aligned}$$

$$\text{Unadjusted } R^2 = 0.751$$

**I.1 (5 points) State the null hypothesis implied by the basic model and auxiliary regression.**

**I.2 (3 points) Compute the numerical value of the test statistic for that hypothesis.**

**I.3 (4 points) State its distribution and degrees of freedom.**

**I.4 (5 points)** Write the critical value for a 5% test, carry out the test, and state whether you would reject the null hypothesis or not. What do you conclude?

**I.5 (5 points)** From the auxiliary regression, select new variables to be added to the original model. Show what criteria you used to select them.

After omitting variables with insignificant coefficients, the best final model is as follows.

$$\hat{\text{gain}} = -140.769 + 0.818 \text{ bwrnk} + 54.957 z3 + 58.821 z4 - 4.872 z6 \\ + 0.047 \text{ tuition}^2 - 0.941 z1^2 - 5.966 z3^2 - 10.646 z4^2 + 1.466 z5^2$$

**I.6 (4 points)** For the independent variables bwrnk, and z6, do the signs of the regression coefficients in the final model make intuitive sense? Explain why you think so.

I.7 (6 points) For the independent variables tuition, z1, z3, z4, and z5, derive the partial derivative of gain with respect to each of them. (Note that sq\_zx is  $zx^2$ ).

tuition:

z1:

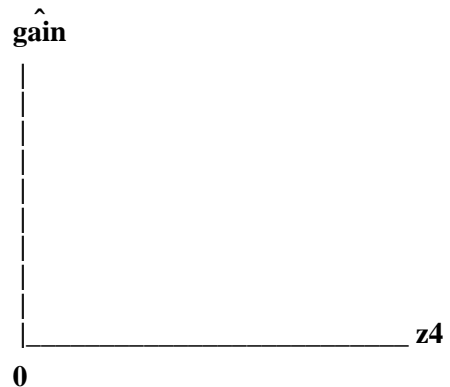
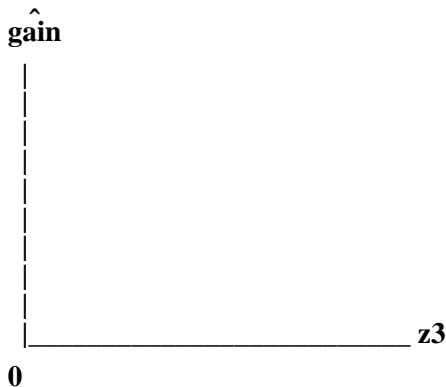
z3:

z4:

z5:

I.8 (4 points) Do the marginal effects of z1 and z5 on gain make intuitive sense? Explain.

I.9 (6 points) The range of values for z3 and z4 are 2 to 4. For z3 and z4 only, draw a free-hand curve, similar to the homework, to indicate the shape of the relationship between gain and the independent variable.



**I.10 (4 points)** Explain whether each of the above shape makes intuitive sense or not (justify your answer carefully).

**z3:**

**z4:**

**I.11 (4 points)** You noted that some of the regression coefficients had the wrong signs. What possible explanation(s) can you give for that?

**II. Consider the following basic model (ignoring the t-subscript).**

$$\text{LCARS} = \alpha + \beta \text{LY} + \gamma \text{LP} + \delta \text{Lr} + u$$

where LCARS = the logarithm of per capita new car sales, LY = log of per capita real income in dollars, LP = log of new car real price index, and Lr = log of interest rate. To capture seasonal differences three dummy variables were defined; D2 = 1 for Spring, 0 otherwise, D3 = 1 for Summer and D4 = 1 for Fall. You have quarterly data for 15 years (60 observations).

**II.1 (2 points)** What is the control season? \_\_\_\_\_

You believe that the entire relation specified in the basic model is different across seasons.

**II.2 (5 points) Derive the most general econometric model (Model U) that is consistent with that belief. Note that it should be in the standard form in which all models are written.**

**I want to test the hypothesis, "the relationships between Fall and Spring seasons are identical."**

**II.3 (3 points) Carefully derive the null hypothesis for the above test.**

**Next I want to use the Wald F-test to test the hypothesis.**

**II.4 (5 points) Derive the restricted model (Model R) for this. Note that this too must be in the standard form.**