Concordia University
Department of Economics

ECON 222/2 - Sections A, BB
Instructors: A. Hammi, and George Tsoublekas

Fall 2005 - ASSIGNMENT 3
Due at noon on Friday, November 11, 2005

Name: **I.D.**   **Section:**

Question 1 (10 points)

Consider the following relationship between the amount of money spent by a province on health care [Y] and the province's GDP [X]:

$$Y_i = \beta_0 + \beta_1 D_{1i} + \beta_2 X_i + \beta_3(D_{1i} X_i) + \varepsilon_i$$

Where D_1 is a dummy variable that takes the value 1 if the province receives provincial equalization payments and 0 otherwise.

Your roommate and colleague in the course decided to define the dummy variable D_2 taking the value 1 if the province does not receive provincial equalization payments and 0 otherwise, and estimates the following model instead:

$$Y_i = \alpha_0 + \alpha_1 D_{2i} + \alpha_2 X_i + \alpha_3(D_{2i} X_i) + \varepsilon_i$$

Describe carefully how you can obtain estimates of the βs from those of αs without running another regression.

Question 2 (20 pts)

A manufacturing company pays its 9 salespeople a small base salary plus a commission equal to the person's sales.
Following charges that the company's salaries structure discriminates against women, the personnel director run a
regression of the base salaries paid during last year (Y), expressed in $ thousand, against (a) the number of months of
the person's employment and (b) a qualitative variable to account for the person's gender. This latter takes the value of
0 for men and 1 for women. The regression results were as follows:

Variable		Estimated Coefficient	Standard Error of Coefficient
Constant	$\hat{\beta}_0$	6.25	-
Months of Employment	$\hat{\beta}_1$	0.23	0.02
Female	$\hat{\beta}_2$	− 0.79	0.24

$R^2 = 0.97$

a. Write down the general estimated function in a reporting mode. (5 points)

b. Write down separately the estimated function for men and the same for women and make a rough sketch to show how they should look. (5 points)

c. Estimate a range for the true coefficient of the dummy variable and interpret it. On the basis of your tests, would you agree that there is sex discrimination built in the company's salaries structure? (5 pts)

d. Would the qualitative results be different, if we had put 0 for women and 1 for men? Explain. (5 points)

Question 3 (70 points)

Assume that you are interested in estimating the **demand function for passenger car motor fuel in the United States.** For this estimation, you plan to use annual time series data covering the period 1965-1983. You consider that per capita demand for motor fuel should depend on income and the price of fuel relative to the price of other goods.

The actual data supplied here (see below) are as follows:

YEAR	Total Motor Fuel Consumed (Billion Gallons)	Total Population (Million)	Average Gross Real Weekly Earnings (1967 $)	Relative Price of a Gallon of Gasoline (Ratio)
1965	50.3	194.3	101.01	1.004
1966	53.3	196.6	101.67	0.998
1967	55.1	198.7	101.84	1.000
1968	58.5	200.7	103.39	0.973
1969	62.5	202.7	104.38	0.954
1970	65.8	205.1	103.04	0.908
1971	69.5	207.1	104.95	0.876
1972	73.5	209.9	109.26	0.859
1973	78.0	211.9	109.23	0.887
1974	74.2	213.0	104.78	1.083
1975	76.5	216.0	101.45	1.060
1976	78.8	218.0	102.90	1.043
1977	80.7	220.2	104.13	1.037
1978	83.8	222.6	104.25	1.006
1979	80.2	225.1	101.15	1.222
1980	73.7	227.7	95.26	1.498
1981	71.7	230.0	93.69	1.508
1982	72.8	232.3	92.45	1.346
1983	73.4	234.5	94.07	1.261

- **Total private motor fuel consumption in billions of gallons.**
- **Average gross weekly earnings of non-supervisory workers in non-government enterprises converted in 1967 dollars** (this way the inflation effect is removed and earnings express real purchasing power) to serve as a measure of income.
- **Total population of USA in millions.**
- **The price index of gasoline divided by the Consumer Price Index** (reflecting the price of gasoline relative to other consumer goods).

Consider the following theoretical models:

Model A: Per Cap MFC = β_{A0} + β_{A1}*Income + β_{A2}*Price + disturbance

Model B: Per Cap MFC = β_{B0} + β_{B1}*Income + β_{B2}*Price + β_{B3}*D + disturbance

Model C: Per Cap MFC = β_{C0} + β_{C1}*Income + β_{C2}*Price + β_{C3}*(D*Price) + disturbance

Model D: Per Cap MFC = β_{D0} + β_{D1}*Income + β_{D2}*Price + β_{D3}*D + β_{D4}*(D*Price) + disturbance

D is a dummy variable to reflect the manipulation of oil prices by OPEC taking the value of 1 from 1973 onward.

a. Considering that each model has a different combination of independent variables, give an interpretation of the economic theory we are trying to test with each of the 4 models. (10 points)

b. Using Excel, make the necessary modifications in the original data and estimate the four models indicated above. For an easy comparison of the different models, prepare and attach (or paste) a summary table that will include the following statistics from each model: the estimated coefficients with their associated t-ratios, and the Adjusted R^2. (10 points)

c. Prepare and attach (or paste) a summary table of the simple estimated relationships of per capita motor fuel consumption versus price (assuming that income is constant at a value of your choice) and provide rough sketches and explanations for each of the four models before and after the OPEC impact. (15 points)

d. Perform the RESET test for each model and prepare and attach (or paste) a summary table with the following statistics from each model: the restricted and unrestricted sums of squares, the degrees of freedom, the estimated F-ratios, the critical F-values, and the conclusion of the test. (20 points)

e. Test whether the restrictions on Model D that result in Model A hold. (5 points)

f. Comment on the results of your overall research making reference to the statistical as well as to the economic aspects. (10 points)