Middle East Technical University **Spring 2014**
Department of Economics
ECON 301

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PROBLEM SET 4

PROBLEM 1

Suppose that a researcher wants to estimate the effects of sex and college graduation on average starting salary and uses the following regression for this purpose:

$Y_t = \beta + a_1 D_{1t} + a_2 D_{2t} + a_3 D_{3t} + a_4 D_{4t} + u_t$

where

$$D_1 = \begin{cases} 1 \; if \; male \\ 0 \; if \; female \end{cases} \qquad D_3 = \begin{cases} 1 \; if \; college \; graduate \\ 0 \; if \; not \; a \; college \; graduate \end{cases}$$

$$D_2 = \begin{cases} 1 \; if \; female \\ 0 \; if \; male \end{cases} \qquad D_4 = \begin{cases} 1 \; if \; not \; a \; college \; graduate \\ 0 \; if college \; graduate \end{cases}$$

What problems might arise in this case ? How can the researcher change the parameterization in order to estimate the desired regression ?

PROBLEM 2

The following investment function is estimated by using OLS for the period between 1951-1976:

$$I_t = 1633.55 + 154.32\, Y_t + 0.12\, M_t + 584.54\, D_t - 41.42\, D_t Y_t + 0.34\, D_t M_t$$

$R^2 = 0.9348 \qquad \sum (I_t - \hat{I}_t)^2 = 67589$

where,

I_t=Investment
Y_t=GNP
M_t=Imports, and

$$D_t = \begin{cases} 0 & \text{for t=1951-1959} \\ 1 & \text{for t=1960-1976} \end{cases}$$

a) Using the estimates given above write two separate investment functions for the periods 1951- 1959 and 1960-1976.

b) Given that $I_{t=}$-996.5+116.19 Y_t+0.37 M_t t=1951-1976 and SSR=493245, test if the change in political power in 1960 caused a structural change in the investment function.

c) Rewrite the investment function given above using first and second parameterizations.

PROBLEM 3

The following linear production functions are estimated:

(1) $\widehat{Y_t}$ = 1.67 L_t+2.58 K_t t=1946.....1960 SSR=0.2116
(0.21) (0.30)

(2) $\widehat{Y_t}$ = 1.89 L_t+3.12 K_t t=1961.....1980 SSR=0.3600
(0.15) (0.35)

(3) $\widehat{Y_t}$= 1.75 L_t+2.67 K_t t=1946.....1980 SSR=1.6216
(0.18) (0.33)

where, Y: Production; K: Capital; L=Labor and the numbers in brackets show standard errors.

a) Using the estimated coefficients above and the dummy variables, write a combined production function for the period 1946-1980 which allows marginal productivities of labor and capital to differ between the two sub-periods.

b) What do the coefficients of the combined production function indicate ?

c) Test if there is a structural change between the production functions of the two sub-periods.

d) Test if marginal productivities of labor and/or capital differ between the two sub-periods (The variance of disturbance term for two subsamples are constant). (Take α= 0.05)

PROBLEM 4

You are given the following estimation results based on annual data pertaining to the period 1963-1980 on the real consumer expenditures. *Y*=Real personal disposable income, *L*=Real liquid asset holdings of the personal sector and *P*=Annual change in the consumer expenditure deflator.

(1) $\widehat{C_t}$=7.04+0.73Y_t+0.09L_t+0.47ΔP_t SSR=0.148 t=1963-1980
(2.28) (6.59) (0.08) (0.06)

(2) $\widehat{C_t}$=6.29+0.56Y_t+0.29L_t+0.47ΔP_t SSR=0.137 t=1963-1977
(4.68) (0.19) (0.19) (0.29)

(3) $\widehat{C_t}$=6.29+6.56Y_t+0.29L_t+0.17ΔP_t+19.61D_t+0.12D_tY_t–0.37D_tL_t–0.56$D_t\Delta P_t$
(3.91) (0.16) (0.16) (0.24) (4.75) (0.17) (0.17) (0.24)

SSR=0.1316 t=1963-1980

SSR stands for the sum of squared residuals. D is a dummy variable;

$$D=\begin{cases}1 & \text{for t=1972-1980}\\ 0 & \text{for t=1963-1971}\end{cases}$$

a) Carry out two tests of structural change for the specification represented by (1) using three model estimates. Take α=0.01.

b) Suppose that the following model is estimated (*t*=1963-1980)

$$C_t=\alpha_0+\alpha_1Y_t+\alpha_2L_t+\alpha_3\Delta P_t+e_1I_{78}+e_2I_{79}+e_3I_{80}+u_t$$

where:

$$I_{78}=\begin{cases}1 & \text{for 1978}\\ 0 & \text{otherwise}\end{cases},\ I_{79}=\begin{cases}1 & \text{for 1979}\\ 0 & \text{otherwise}\end{cases},\ I_{80}=\begin{cases}1 & \text{for 1980}\\ 0 & \text{otherwise}\end{cases}$$

What would be the values of $\hat{\alpha}_0$, $\hat{\alpha}_1$, $\hat{\alpha}_2$ and $\hat{\alpha}_3$? What do the coefficients of these dummy variables indicate? What would be the SSR of this model? How would you carry out the corresponding test ?