44-6873-00L- **Econometrics for Business and Economics**	Dr Amr Algarhi (Miro) Department of Management Sheffield Hallam University
Exercise sheet **5. Functional forms of regression models** Week 19	

Question 1 (Stata). Log-linear regression model

Consider the celebrated Cobb-Douglas (CD) production function which is expressed as:

$$Y_i = AL_i^{\beta_2} K_i^{\beta_3}$$

where Y is the output as measured by value added, in thousands of dollars, L is labour input (worker hours, in thousands) and K is capital input (capital expenditure, in thousands of dollars) for the USA manufacturing sector.

Download the "***production.dta***" file, which includes the cross-sectional data, covering 50 states and Washington, DC for the year 2005.

(a) The above model is nonlinear in the parameters. Take the logarithm of the CD production function. Write down a new model that is linear in the parameters β_2 and β_3.

(b) Estimate the new model you developed in part (a).
Hint:

```
generate lnoutput = ln(output)
generate lnlabor = ln(labor)
generate lncapital = ln(capital)
```

(c) Interpret the regression slope estimates.

(d) Test the hypothesis that the US CD production function was characterised by constant returns to scale in 2005.
Hint: `lincom lnlabor + lncapital - 1`

Question 2 (Stata). Quadratic regression model

Suppose the following model of hamburger sales for Big Andy's Burger Barn, where sales depend on the price charged and the level of advertising.

$$SALES = \beta_1 + \beta_2 PRICE + \beta_3 ADVERT + u$$

where $SALES$ is monthly sales in a given city and is measured in \$1,000 increments, $PRICE$ is price of a hamburger measured in dollars, $ADVERT$ is the advertising expenditure also measured in thousands of dollars.

Download the "***andy.dta***" file, which includes the data for the above sales model.

(a) Consider the marginal effect of an additional $1000 of advertising is expected to diminish as more advertising is used. Re-write the above model to accommodate this feature.

(b) Estimate the new model you developed in part (a).
Hint: **`generate advert2 = advert*advert`**

(c) Find the marginal effect of advertising expenditure on monthly sales, when advertising expenditure is $500.
Hint: **`scalar me = _b[advert] + (2*(.5)*_b[advert2])`**
Hint: **`scalar list me`**

(END)