44-6873-00L- **Econometrics for Business and Economics**	Dr Amr Algarhi (Miro) Department of Management Sheffield Hallam University
Exercise sheet **3. Simple linear regression model II** Week 15	

Question 1. Based on data for years 1962 to 1977 for the United States, the following demand function for automobiles was obtained (standard error in parentheses)

$$\hat{Y}_t = 5807 + \underset{(1.634)}{3.24} X_t$$

$$R^2 = 0.22$$

where Y is the retail sales of passenger cars (in thousands of dollars) and X is the real disposable income (in billions of 1972 dollars) and the subscript t stands for time.

(a) Construct a 95% confidence interval for the slope parameter.

(b) Test the hypothesis that the slope parameter is statistically significant at the 5% significance level.

Question 2. The following regression results are based on sample of 72 students (standard errors in parentheses). In order to evaluate the effect of height on academic performance, the scores on a general standardised examination were regressed on height (in centimetres)

$$\widehat{SCORE}_t = \underset{(137.9)}{902} - \underset{(1.941)}{3.16} X_t$$

You are given the following information:

$$ESS = 5{,}923$$

$$RSS = 156{,}576$$

$$TSS = 162{,}499$$

(a) Calculate the R^2 for the model and explain its meaning.

(b) Construct a 95% confidence interval for β_2, where β_2 refers to the true population parameter.

(c) Do you reject the null hypothesis $H_0: \beta_2 = 0$ at the 5% significance level?

(d) Do you reject the null hypothesis $H_0: \beta_2 = 1$ at the 5% significance level?

<u>Question 3 (Stata).</u> Download the "***food.dta***" file, which includes data for weekly household food expenditure and weekly household income. The variable $food\_exp$ is the weekly household food expenditure (in pounds); this is the variable we would like to explain. The variable $income$ is the weekly household income (in hundreds of pounds).

(a) Open the file **food.dta** and estimate the food expenditure model.
Hint: `reg food_exp income`

(b) Locate the estimated variance of the error terms from the main output in (a).

(c) Obtain the regression coefficients and its standard error separately.
Hint: `display _b[income]`
Hint: `di _se[income]`

(d) Obtain the estimated variances for the regression coefficients.
Hint: `estat vce`

(e) Construct a 95% confidence interval for the slope parameter.
Hint: The regression output includes **[95% conf. Interval]** which are the lower and upper bounds of the interval estimates for the corresponding coefficients.

food_exp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
income	10.20964	2.093264	4.88	0.000	5.972052	14.44723
_cons	83.416	43.41016	1.92	0.062	-4.463279	171.2953

- <u>to calculate the critical value of t</u>
```
scalar tc975 = invttail(38,0.025)
di "t(38, 0.025) value = " tc975
```

- <u>to construct the confidence interval</u>
```
scalar ub2 = _b[income] + tc975*_se[income]
scalar lb2 = _b[income] - tc975*_se[income]
di " beta_2 95% confidence interval is " lb2 " , " ub2
```

(f) Test the hypothesis that the slope parameter is statistically significant at the 5% significance level.
Hint:
```
scalar tstat1 = (_b[income]/_se[income])
di "t-statistic for H0: beta2 = 0 is " tstat1
di "t(38, 0.025) = " invttail(38, 0.025)
di "-t(38, 0.025) = " invttail(38, 0.975)
```

Alternative way: `lincom income`

(END)