44-6873-00L- **Econometrics for Business and Economics**	Dr Amr Algarhi (Miro)
Exercise sheet **8. Heteroskedasticity**	Department of Management
Week 29	Sheffield Hallam University

Question 1 (Stata).

Use the same food expenditure data from exercise sheet 2. 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) Using the food expenditure data, estimate the model using least squares. Then, plot the data and the estimated regression line in the same graph.
Hint:
```
graph twoway scatter food_exp income
graph twoway lfit food_exp income
graph twoway (scatter food_exp income) (lfit food_exp income)
```

(b) Detect heteroskedasticity in the above model by
  i.   plotting the residuals against the weekly household income.
       Hint:
```
predict uhat, res
graph twoway scatter uhat income, yline(0)
```

  ii. Plotting the residual squares against the weekly household income.
       Hint:
```
generate uhatsqr = uhat*uhat
graph twoway scatter uhatsqr income
```

(c) Use Park test to detect heteroskedasticity.
   Hint:
   Run the following new regression using the explanatory variable (income) in the original regression.
$$\ln \hat{u}_i^2 = \alpha_1 + \alpha_2 \ln X_i + v_i$$

   Then, test the null hypothesis that $\alpha_2 = 0$ (there is no heteroskedasticity).

```
generate lnuhatsqr = ln(uhatsqr)
generate lnincome = ln(income)
reg lnuhatsqr lnincome
```

(d) Detect heteroskedasticity using the BP test and the White's general heteroskedasticity test.
Hint:
```
reg uhatsqr income

reg food_exp income
```
Statistics > **Linear models and related** > **Regression Diagnostics** > **Specification test, etc.**

(e) Estimate the food expenditure model again using least squares and store the estimates. Re-estimate the model using White's heteroskedasticity robust standard errors and store the results. Print and compare both sets of results.
***Hint*:**
```
quietly regress food_exp income
estimates store Usual

quietly regress food_exp income, vce(robust)
estimates store White

estimates table Usual White, b se stats(F)
```
Statistics > **Linear models and related** > **Linear regression**

(f) Estimate the food expenditure model using the weighted least squares (WLS).
***Hint*:**
```
regress food_exp income [aweight=1/income]
```


(END)