Econ 301 **Bilkent University**
Econometrics **Department of Economics**

Lab Exercise 6

The American households tend to travel when they take a vacation. The distance they travel for vacationing is modelled as follows:

$$miles_i = \beta_1 + \beta_2 income_i + \beta_3 age_i + \beta_4 kids_i + \varepsilon_i$$

where the distance of vacationing is a function of the family income, age of the head of the household, and the number of kids in the family.

a) What are the expected signs for the above coefficients?
b) Estimate the model.
c) Examine the residuals of the above estimation. Try plotting the residuals against age and income. (Choose X-Y graph and scatter diagram)
What do you observe? If the same graphs are calculated for squares of the residuals do the results change? What can you say about the form of heteroscedasticity according to these plots?

d) Conduct a **Breusch_Pagan** general test for heteroscedasticity Run the following regression:

$$\hat{u}_i^2 = \alpha_1 + \alpha_2 Income_i + \alpha_3 Age_i + \alpha_4 Kids_i + v_1$$

e) Conduct a **White general heteroscedasticity** test. Run the following regression:

$$\hat{u}_i^2 = \alpha_1 + \alpha_2 Income_i + \alpha_3 Age_i + \alpha_4 Kids_i + \alpha_5 Income^2{}_i + \alpha_6 Age^2{}_i + \alpha_7 Kids^2{}_i + \alpha_8 Income_i Age_i + \alpha_9 Age_i Kids_i + \alpha_{10} Kids_i Income_i + v_1$$

f) Compare the variance estimate for the OLS coefficients with the White's heteroscedasticity robust variances.

g) If you conclude that the assumption

$$Var(u_t) = \sigma^2 Income_t$$

Find the generalized (weighted) least square estimates of the coefficients if the above hypothesis is the correct assumption about heteroscedastic error terms. (You need to scale the variables with the appropriate factor. Here all the variables in the model should be divided by $\sqrt{income_t}$)