ADVANCED ECONOMETRICS

# TA - CLASS 1

# SCHEDULE FOR TODAY

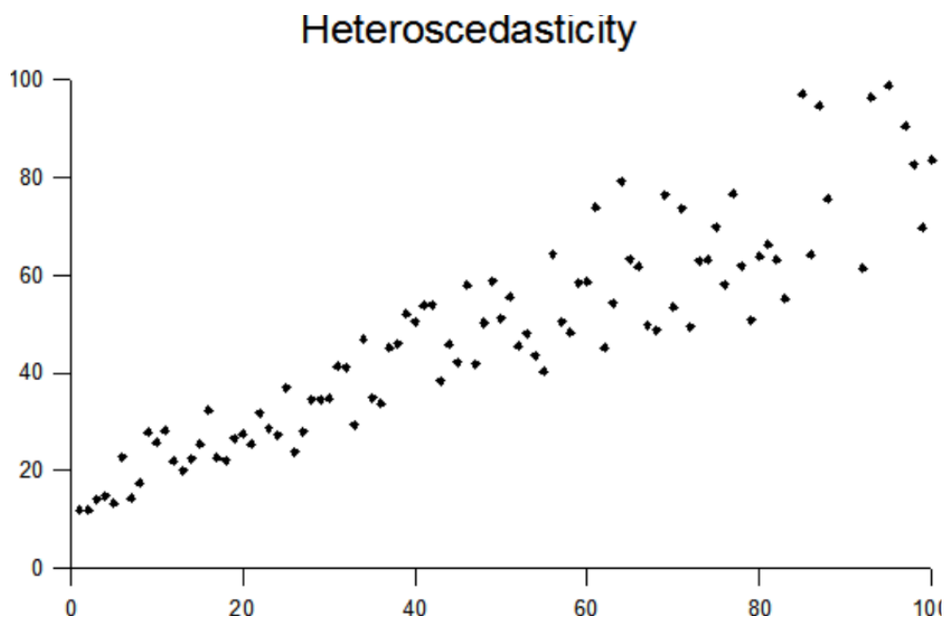
- Homework 1 review
- Concepts and Definitions
  - Heteroscedasticity
  - White Test
- Exercise

# HOMEWORK REVIEW

- Get the data.
  - General examples - Oficial Website : https://www.stata-press.com/data/r8/u.html
  - Others examples - .dta: http://www.principlesofeconometrics.com/stata.htm
  - Others formats (.csv, .xml ...): https://www.kaggle.com/
    - Show how to import others formats.
- Analize N/A and decide how to do with them.

# HETEROSKEDASTICITY

- Heteroskedastic: from Ancient Greek ***hetero*** "different" and ***skedasis*** "dispersion")
- What is it means in statistics?
- Examples: Income VS Meal OR Rocket taking off
- Graphic example:



# WHITE TEST

- To test whether the variance of the errors in a a regression model is constant. If yes, there is homoskedasticity in the model.
- H0: V(u | x) = sigma^2 ; H1: V(u | x) = g(x)
- Homoscedasticity situations = nR ^ 2 = chi-square distribution with k-1 degrees of freedom, where k is the number of explanatory variables included in the model.
- An alternative to the White test is the Breusch–Pagan test
- In stata we use the command “whitetst”

# EXERCISE 1

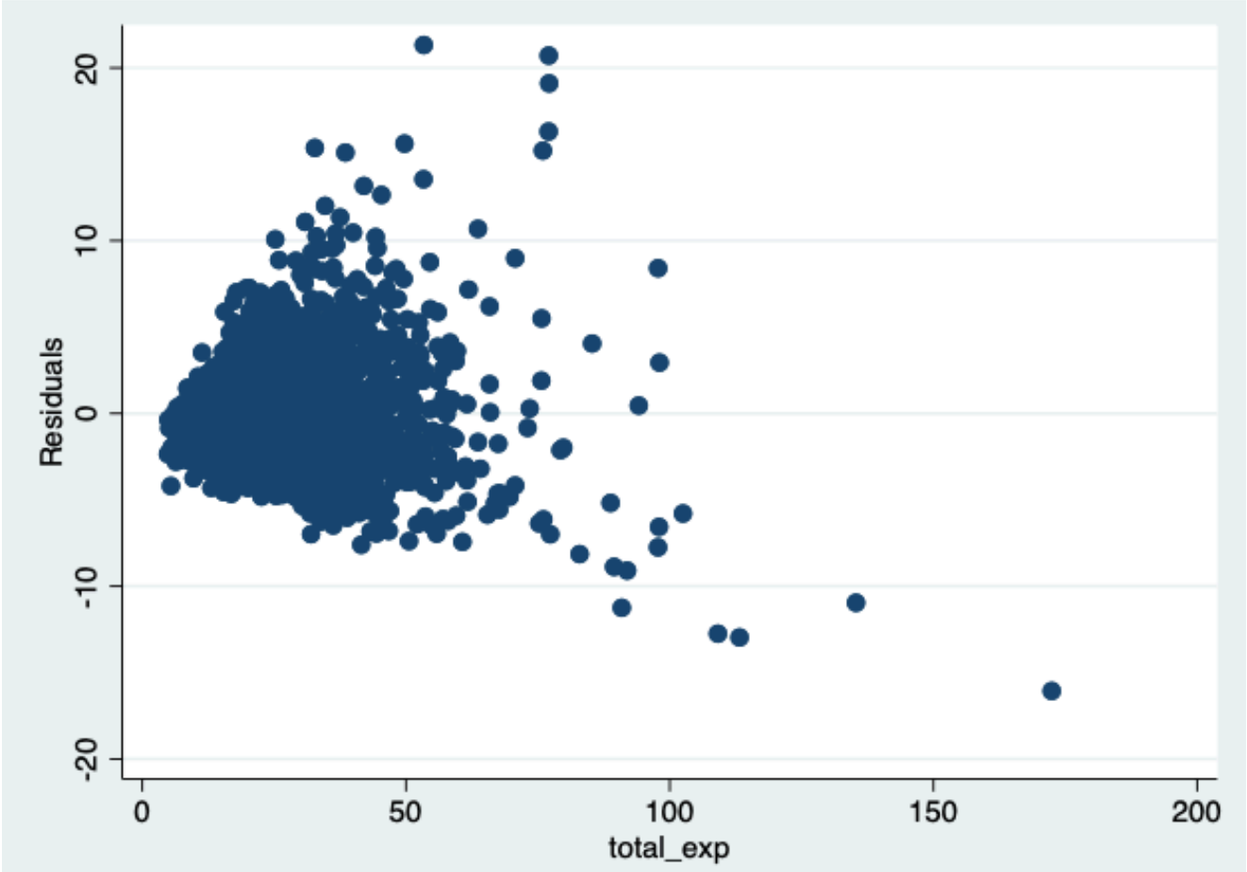
- Estimate a linear Engel curve for food expenditure (q = f(x,z,β)), where q is the food expenditure (in hundreds of thousands of pesetas), x is the total expenditure (in hundreds) of thousands of pesetas) and z is a vector of characteristics of the household (number of adults, number of children and age of the husband). Comment the results
  - reg food_exp total_exp kids adults age_hus

| Source | SS | df | MS | Number of obs | = | 3,371 |
|---|---|---|---|---|---|---|
| | | | | F(4, 3366) | = | 469.26 |
| Model | 13296.9361 | 4 | 3324.23402 | Prob > F | = | 0.0000 |
| Residual | 23844.5384 | 3,366 | 7.08393891 | R-squared | = | 0.3580 |
| | | | | Adj R-squared | = | 0.3572 |
| Total | 37141.4744 | 3,370 | 11.021209 | Root MSE | = | 2.6616 |

| food_exp | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| total_exp | .1328907 | .0039081 | 34.00 | 0.000 | .1252281 | .1405532 |
| kids | .5881838 | .047104 | 12.49 | 0.000 | .4958284 | .6805393 |
| adults | .5546917 | .0524838 | 10.57 | 0.000 | .4517882 | .6575951 |
| age_hus | .0204881 | .0058684 | 3.49 | 0.000 | .0089821 | .0319942 |
| _cons | .6124797 | .2816766 | 2.17 | 0.030 | .0602051 | 1.164754 |

# EXERCISE 1

- Plot the residuals as a function of total expenditure and comment the results.
  - rvpplot total_exp



# EXERCISE 1

- The data set epflic.dta file contains a subsample of 3371 households from the Family Budget Survey 1990/91 formed by couples with or without children in which the husband has completed compulsory studies, is between 24 and 65 years old and is an employee in a non-agricultural activity; the woman does not work. Using this data:
- Test the hypothesis of homoskedasticity of the errors using White's test. Make the test first by generating the variables you need and making the appropriate regression. Then use the command provided by STATA to perform the White test and verify that the results obtained are the same.

White test:

$$H_0 : \sigma_t^2 = \sigma^2 \quad \text{vs} \quad H_1 : \sigma_t^2 \text{ is a function of the regressors}$$

White's test statistic is $W = nR^2 \rightarrow_d \chi^2_{14}$ under $H_0$, where $R^2$ is the one from the regression in Table In this exercise

$$W = 3371 * 0.211117 = 711.67.$$

Therefore we can reject null hypothesis at any level of significance. The errors are heteroskedastic and their variance depends on the regressors of the model.

# EXERCISE 1

- predict resid
- estat imtest, preserve white

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(14)     =    711.67
         Prob > chi2  =    0.0000

Cameron & Trivedi's decomposition of IM-test
```

| Source | chi2 | df | p |
|---|---|---|---|
| Heteroskedasticity | **711.67** | **14** | **0.0000** |
| Skewness | **23.66** | **4** | **0.0001** |
| Kurtosis | **13.19** | **1** | **0.0003** |
| Total | **748.53** | **19** | **0.0000** |