

**Lab Exercise 2**

According to growth theory, the growth rate of a country is influenced by the trade policy, ie. the higher the trade in the country the faster will the economy grow. To test this contention the following data for average annual percentage growth rate of GDP (Y) and the average share of trade in the economy (X) (defined as import + exports/GDP) data is collected and reported in the growth data file.

1. Plot the data as scatter diagram for the business sector. What can you say about the relationship?
2. Estimate the following relationship:

$$Growth_i = \beta_1 + \beta_2 Trade_{share}_i + u_i \text{ ----- EQ1 or in general terms}$$

$$Y_i = \beta_1 + \beta_2 X_i + u_i$$

**ANSWER THE FOLLOWING QUESTIONS FOR EQ 1. THIS EXERCISE WILL NUMERICALLY SHOW THAT THE NUMERICAL PROPERTIES OF OLS HOLDS**

3. Write the fitted equation for  $\hat{Y}_i$  and compute the fitted values of the dependent variable  $\hat{Y}_i$  using EViews,
4. What are the mathematical and economic interpretations of  $\beta_1$  and  $\beta_2$ .
5. Which country is an outlier in this sample?
6. According to the estimated equation (fitted value of the regression) what is the predicted growth rate of a country if trade share is equal to 0.5? How will your answer change for a country with trade share equal to 1.
7. Test the null hypothesis that  $\beta_2 = 0$ . What happens to the model if this is true?
8. What is the sum of squared residuals?
9. Compute  $\hat{\sigma}^2$ , estimated residual variance for this equation?
10. Re-estimate the equation excluding the outlier country Malta from the sample. How does the estimate of  $\beta_2$  change? Compare two estimates of your answer to question of ‘how much?’.

**ON YOUR OWN ANSWER THE FOLLOWING QUESTIONS FOR EQ 1. THIS EXERCISE WILL NUMERICALLY SHOW THAT THE NUMERICAL PROPERTIES OF OLS HOLDS**

11. Compute the mean value of  $Y_i$  and  $\hat{Y}_i$ .
12. Compute the residual values.
13. Verify that  $\sum \hat{u}_i$  is equal to zero.
14. Verify that the equation goes through means of the variables. Find the means and show that  $\bar{Y} = \hat{\beta}_1 + \hat{\beta}_2 \bar{X}$

**MORE DIFFICULT**

14. The residual ( $\hat{u}_i$ ) are uncorrelated with the fitted values of the dependent ( $\hat{Y}_i$ ) variable. Show that  $\sum \hat{y}_i \hat{u}_i = \sum (\hat{Y}_i - \bar{Y}) \hat{u}_i = 0$
15. The residual ( $\hat{u}_i$ ) are uncorrelated with the independent ( $X_i$ ) variable.

$$\sum x_i \hat{u}_i = \sum (X_i - \bar{X}) \hat{u}_i = 0$$