October 29, 2021 **Test 2** Econometrics, HSE

You have 40 minutes to complete the test. Please explain each step of your derivations and state all the assumptions employed. Note that different problems can give you different points. Maximum for the test is 10 points.

*For* ***problems 1 and 2*** *use the following numbers:*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ***N (number of observations)*** |  |  |  |  |  |  | ***R2*** |
| 10 \* (number of letters in your name in English + number of letters in your surname in English) | number of letters in your name in English + 0.1 | the order number[[1]](#footnote-1) of your name’s first letter in the alphabet / 10 | number of letters in your surname in English + 0.2 | the order number of your surname’s first letter in the alphabet / 10 | number of letters in your surname in English – number of letters in your name in English + 0.3 | (the order number of your name’s first letter in the alphabet + the order number of your surname’s first letter in the alphabet) / 10 | (your group number (e.g., 1, 2, 3) + 4) / 10 |

**Problem 1**

An econometrician estimated this model with N observations:

Assuming the disturbance term has a standard normal distribution, calculate the 95 per cent confidence interval for and . [1 point]

What can you conclude from this calculation? [1 point]

**Problem 2**

An econometrician estimated the model with N observations (persons). In this model: EARNINGS – hourly earnings of person ($), S – Number of years of study. Along with the coefficient estimates, the researcher also got the R2 value.

*R2*

Assuming the disturbance term has a standard normal distribution, perform an F test on the goodness of fit of the equation writing down the null and alternative hypotheses. What can you conclude from this calculation? [1 point]

Give an interpretation of the coefficients estimates. [1 point]

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**Problem 3**

An econometrician estimated two linear models based on the same 90 observations (persons). In this model: GRADE – the grade a student got for his econometric test (points, out of 10), H – hours of studying before the test.

*Model 1: , R2 = 0.43*

*Model 2:*  , *R2 = 0.52*

Which model would you use? Explain. [2 points]

**Problem 4**

A researcher investigating the determinants of the demand for public transport in a certain city has the following data for 100 residents for the previous calendar year: expenditure on public transport, E, measured in dollars; number of days worked, W; and number of days not worked, NW *(by definition, NW is equal to 365 – W).* He attempts to fit the following model:

Explain why it is impossible to fit this equation. Give intuitive explanations. [1 point]

The researcher estimated model using the OLS method. What can we say about the OLS estimator of coefficients if is a disturbance term that is independently and identically distributed with expected value a ≠ 0. [1 point]

**Problem 5**

Prove that the OLS estimator of coefficients in a multiple regression is unbiased if the Gauss–Markov conditions are satisfied (Use the matrix notation). [1 point]

Derive the variance of the coefficients (Use the matrix notation). [1 point]

1. See the ordered alphabet after the problem set [↑](#footnote-ref-1)