Müəllimin adı: Alıyev Xətai Şahin

Fənnin adı: Econometrics

Qrupun nömrəsi: 1006/1044

Mövzu 1. Review of some elements of statistics and probability distribution

1. Explain the notions of population, sample and the difference between these two on an example.
2. Explain the notions of variance, standard deviation and the covariance on an example. What these indicators display for you from economic point of view?
3. Assume that you are going to estimate the relationship between students' GPA and their entrance score in case of the *faculty of International School of Economics* at *UNEC*. How you will follow <u>randomness</u> and <u>representativeness principles</u> for your sample?

Mövzu 2. Introduction to Econometrics

4. Explain aim and objectives of econometrics.
5. Explain the steps in an empirical analysis by using a <u>sample research case.</u>
6. Comment on data structures in an empirical analysis and explain the types of data. Show an example for each data type.
7. What is the difference between panel data and pool data? Explain on an example with 3 variables.
8. Explain the process of creating Workfile in E-views 9 for time-series and cross sectional dataset.
9. Assume that you have conducted a survey among 150 ISE students and collected information about *GPA* and *entrance score* of each one. Explain the process of how to add collected **data** to the created E-views 9 workfile.
10. Explain importance of "ceteris paribus" assumption from econometric point of view. Why we should state "ceteris paribus" and "in average" in our interpretations?

Mövzu 3-4. The Simple Regression Model

11. Explain the notion of *explanatory variable*, *independent variable*, *intercept*, and the *slope parameter* in a simple linear regression model. Show each of these notions on an example.
12. Population regression function and sample regression function: why we write E(Y/X)? Why "zero conditional mean assumption" is required?
13. Explain the difference between *actual value*, *fitted value*, and *residuals* on an example simple regression model.
14. Minimizing "sum of residuals" or "sum of squared residuals"? Explain the main logic how OLS works?
15. Under which assumptions OLS parameters are *unbiased*? Briefly explain each assumption.
16. Explain the notion of "goodness of fit". What is the logic behind this indicator?
17. According to given **simple linear regression model** and the value of **Goodness of Fit**:
    a) Comment on the direction of the relationship. Does the intercept have a useful interpretation here? Explain. How much higher is the *"dependent variable"* predicted to be if the *"independent variable"* value is increased by … points?

b) What is the predicted value of *"dependent variable"* when *"independent variable"* is … ?

c) How much of the variation in *GPA* for these 500 students is explained by *entrance score*? Explain.

18. According to given two different simple regression models about <u>families' income elasticity of consumption</u> in <u>Baku city center</u>, and <u>surrounding villages</u>. Note that R^2 value is also provided.

    a) Comment on the direction of the relationship for each model. Interpret the slope parameters.

    b) Compare the income elasticity of families' consumption spending: those living in Baku city center vs living in surrounding villages.

    c) How much of the variation in *the dependent variable* for those families is explained by *income*? Explain. Comment on the difference for these two models. Does it make sense?

19. According to given two different simple regression models (*log-log*, and *log-lin*) with the same variables, and the values of R^2 for each model:

    a) Comment on the direction of the relationship for each model. Interpret the slope parameters.

    b) How much of the variation in *the dependent variable* is explained by *the independent variable*? Explain. Comment on the difference for these two models. Does it make sense?

    c) Which model should be chosen? Why?

20. According to given two different simple regression models (*log-log*, and *log-lin*) with the same variables, and the values of R^2 for each model:

    a) Comment on the direction of the relationship for each model. Interpret the slope parameters.

    b) How much of the variation in *the dependent variable* is explained by *the independent variable*? Explain. Comment on the difference for these two models. Does it make sense?

    c) Which model should be chosen? Why?

21. According to given two different simple regression models (*lin-lin*, and *lin-log*) with the same variables, and the values of R^2 for each model:

    a. Comment on the direction of the relationship for each model. Interpret the slope parameters.

    b. How much of the variation in *the dependent variable* is explained by *the independent variable*? Explain. Comment on the difference for these two models. Does it make sense?

    c. Which model should be chosen? Why?

Mövzu 4. Multiply regression model 1

22. Simple regression vs multiply regression: explain the motivation for multiply regression.

23. Explain *perfect collinearity* assumption. What happens if endogenous variables are perfectly correlated? Explain on an example.

24. According to given multiply regression model with two independent variables, answer to the following questions. Note that dependent variable and one of the independent variable are in "log". Value of R^2 for the model is also provided:

   a) Comment on the direction of the relationship for each regressors. Interpret the slope parameters.
   b) How much of the variation in *the dependent variable* is explained by *independent variables?* Explain.
   c) How much *the dependent variable* is expected to change if both variable changes at the same time by some amount (*for example, one independent variable increases 5 unit while other one decreases 2 unit*).

25. According to given multiply regression model with two independent variables, answer to the following questions. Note that dependent variable is in linear form. One of the independent variable is in "log". Value of R^2 for the model is also provided:

   a) Comment on the direction of the relationship for each regressors. Interpret the slope parameters.
   b) How much of the variation in *the dependent variable* is explained by *independent variables*? Explain.
   c) How much *the dependent variable* is expected to change if both variable changes at the same time by some amount (*for example, one independent variable increases 5 unit while other one decreases 2 unit*).

Mövzu 5-6: Multiply regression models.

26. Explain omitted variable biasedness in case of a multiply regression model. Note that true model should have 3 independent variable (x_1, x_2, x_3) but in the estimated model, x_2 is omitted. How model parameters and error variance will change?

27. Explain irrelevant variable biasedness in case of a multiply regression model. Note that true model should have 2 independent variable (x_1, x_2) but in the estimated model, x_3 is also added. How model parameters and error variance will change?

28. What variance of each coefficient in a regression model displays? What will be the result of large coefficient variance and small coefficient variance?

29. The formula of calculating variance of coefficients ($Var(\beta_j)$) is given: $Var(\beta_j) = \frac{\sigma^2}{TSS_j(1-R_j^2)}$). Explain how variance of coefficient changes if <u>sample size</u> increases?

30. The formula of calculating variance of coefficients ($Var(\beta_j)$) is given: $Var(\beta_j) = \frac{\sigma^2}{TSS_j(1-R_j^2)}$). Explain how variance of coefficient changes if number of <u>irrelevant</u> independent variables increases?

31. What variance inflation factors show? If the value of variance inflation factor is more than 10, what can you say as an econometrician? Explain what how the value of variance inflation factors is computed?

32. Explain Classical Linear Model (CLM) assumptions briefly.

33. Based on the same sample, two different estimated models will be given. Dependent variable is the same. One model has only one independent variable while another has two explanatory variables. One independent variable is the same. According to given estimated regression models:
    a) Interpret slope parameters of both models.
    b) How much dependent variable will change, in average, if both independent variable changes at the same time, at a certain amount?
    c) Here, the second independent variable is important variable or not? How much it affects the coefficient of another independent variable?

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Mövzu 7-8: Multiply regression analyses: inference.

36. Explain the logic behind Type I and Type II error? Which one is more crucial?
37. Explain the notions of individual statistical significance, economic significance, and joint significance? Support your explanation on an example for each.
38. Hypothesis testing (individual significance) against one alternative and two sided alternative. Explain on an example.
39. Calculate interpret confidence intervals for a slope parameter - β_j . Note that <u>critical value of t-statistic</u> at 5% level of significance, <u>standard error of that coefficient</u> and the value of estimated β_j is given. Comment on statistical significance of the relationship according to calculated confidence intervals.
40. Calculate interpret confidence intervals for a slope parameter - β_j . Note that <u>critical value of t-statistic</u> at 5% level of significance, <u>standard error of that coefficient</u> and the value of estimated β_j is given. Comment on statistical significance of the relationship according to calculated confidence intervals.
41. An estimated multiply regression model (with 3 independent variables) is given. Coefficients are calculated and provided. Meanwhile, you have the value of standard error or t-statistic value for each coefficient. According to given information:

    a) Fill the blanks, i.e. (…), and [….]. (*Calculate standard error or t-statistic value which is not given*)

b) Comment on individual statistical significance of <u>all coefficients</u> at 1% and 5% level of significance (note that $\alpha = 0.01, t_{cr} = 2.57$; $\alpha = 0.05, t_{cr} = 1.96$).
c) Interpret slope parameters.

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    c) Interpret slope parameters.

43. The question is about testing joint significance. You will have all required information for both restricted and unrestricted models. Formula of F-test ($F = \frac{(R_{ur}^2 - R_r^2)/q}{(1 - R_{ur}^2)/(n-k-1)}$), and F critical value at 5% level of significance are also given.
According to estimation results, decide whether the variables should be included to the model or not?

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Mövzu 9-10: Multiply regression analyses: further issues

45. Quadratic functional forms: when and why we use? Explain the motivation for quadratic functional forms on an example.

46. An estimated quadratic regression model is given.
    a) According to the estimated model, you should <u>interpret the impact of independent variable with quadratic term over the dependent variable</u>.
    b) You should specify the direction of marginal impact between <u>independent variable with quadratic term and the dependent variable</u> at a certain value of the independent variable. Explain, why?

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49. A model with interaction term is given. Model coefficients, standard error of each coefficient as well as critical values of t-test at 1%, 5% and 10% are provided. Using the available information:
    a) Interpret slope parameters.
    b) Is the coefficient of <u>interaction term</u> statistically significant? Justify your answer. What this significance test result implies for you?

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    a) Interpret slope parameters.
    b) Is the coefficient of <u>interaction term</u> statistically significant? Justify your answer. What this significance test result implies for you?

Additional 25 questions for FİNAL exam

51. What may be the major outcome of functional form misspecification? What one should do if there is functional form misspecification problem in the estimated model?
52. Explain logic of the tests for functional form misspecification and testing procedure.
53. The question is about whether there is or not functional form misspecification problem. Two different estimated models, standard error of each coefficient are given. In the second model, quadratic of an independent variable is also added to the model.
54. The question is about whether there is or not functional form misspecification problem. An E-views output of Ramsey-Reset test is given.
55. Explain the motivation for the use of Adjusted R-Squared?
56. The question is about comparison of two estimated regression models. Note that R-squared and Adjusted R-Squared values for each model are given.
57. How can you compare two models with different dependent variables (i.e., Y_t and $\log(Y)_t$)?
58. Explain the motivation for the use of qualitative information in empirical estimations. Support your answer by using examples.
59. Explain dummy variable trap.
60. The question is about interpretation of dummy independent and dummy-interaction terms. E-Views output of an estimated multiply regression model is given.
61. The question is about interpretation of dummy independent and dummy-interaction terms. E-Views output of an estimated multiply regression model is given.
62. Explain the motivation for the use of interaction with dummy variables in regression models. Support your arguments on an example.
63. Testing for differences across groups
64. The logic of linear probability models. Explain on an example.
65. The question is about Linear Probabilistic Models. Dependent variable is dummy variable. Independent variables are dummy variables or quantitative variables. E-Views output is given.

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67. Explain the notion and consequences of heteroscedasticity. What is the testing procedure?
68. Explain estimation procedure of Breusch-Pagan-Godfrey, ARCH, and White tests. How you can decide whether there is heteroscedasticity problem or not?
69. The question is about interpretation of Heteroscedasticity test results (ARCH, Breusch-Pagan-Godfrey, White). E-views outputs are given.
70. Explain Gauss Markov assumptions for time series analysis.
71. The question is about interpretation of Serial Correlation test results at different lags. E-views outputs are given.
72. Dynamic models vs static models: explain the difference on an example. What is the motivation for the use of dynamic models?
73. Trending variables and seasonality problem in regression analyses. Why researchers should take trend and seasonality problems into account in empirical estimations?
74. Explain the notion of stationarity and non-stationarity.
75. The question is about interpretation of unit root test results (ADF and KPSS). E-views outputs are given.