

**AZƏRBAYCAN RESPUBLİKASI TƏHSİL NAZİRLİYİ**

**AZƏRBAYCAN DÖVLƏT İQTİSAD UNİVERSİTETİ**

**BEYNƏLXALQ İQTİSADİYYAT MƏKTƏBİ**

**Müəllim: Əlim Rüstəmov**

**Fənn: Ekonometrika**

**Qrup : 1082**

1. \*Explain the essences of the random variable, experiment and outcome. Give an example describing all of them.
2. \*What is the difference between discrete and continuous random variables?
3. \*What is expected value of the random variable? Give an example about that as well.
4. \*\*What are the main properties of the expected value?
5. \*Explain the difference between population and sample. Why there is a need for sampling?
6. \*What is econometrics and why there is a need for that?
7. \*\*What are the main goals of using econometric methods?
8. \*\*How does one go about *structuring* **an empirical economic analysis**?
9. \*What are the main differences between the cross-sectional and time-series data?
10. \*What is the ceteris paribus effect? What is its role in the econometric models?
11. \*Form a simple econometric model and give explanations of every elements of the model.
12. \*\*Why is it assumed that the changes in error term (u) and in other variables have to be zero, while analyzing the effect of the independent variable?
13. \*\*What are the restrictive assumptions made for having fair ceteris paribus effect, while forming a regression.
14. \*\*\*Derive the OLS estimates of B0 and B1.
15. \*\*\*Prove that SST = SSE + SSR.
16. \*\*\* Problem solving: Find the intercept and slope of the relationship.
17. \*\*How many assumptions there are for unbiased simple regression function? Why there is a need for those assumptions?
18. \*\*\*Prove the unbiasedness of OLS by considering the first four assumptions for SLR.
19. \*\*Explain the assumption of the homoscedasticity.
20. \*\*Give examples for both cases of homoscedasticity and heteroscedasticity assumptions and show the difference on the graph.
21. \*What are the multiple regression model and its differences from the simple regression model?
22. \*\*Derive the OLS estimates for multiple regression function. What are the first order conditions of OLS?
23. \*How does the ceteris paribus work in the multiple regression models?
24. \*\*Assuming there is a multiple regression model:

y=b0+b1\*X1+b2\*X2+u

How the sole effect in one independent variable is calculated in the multiple regression models while having the ceteris paribus at the same time?

1. \*\*There are 2 models of:

y=b0+b1\*X1+u

y=b0+b1\*X1+b2\*X2+u

Are b1`s the same in both models? Why/why not?

1. \*How the multiple regression and the simple regression is differed? Why do we need multiple regression analysis, while we have the simple one? Explain your answer clearly.
2. \*\*\*What is the “partialling out” effect? How the B1 is calculated (formula) in below case:
3. \*\*In which cases, B1`s in the simple regression and multiple regression analysis are the same? Explain your opinion broadly.
4. \*How the R2 is affected (increase or decreasing) when the new independent variable is added to the model? And why? What is the better alternative to use for the analysis?
5. \*What are the Gauss Markov assumptions? Why these assumptions are needed? Explain one of them in your answer.
6. \*\*In a study relating college grade point average to time spent in various activities, you distribute a survey to several students. The students are asked how many hours they spend each week in four activities: studying, sleeping, working and leisure. Any activity is put into one of the four categories, so that for each student, the sum of hours in the four activities must be 168. The model is:

What assumption is violated in this model and how would you solve the violation problem?

1. \*\*\*The following equation represents the effects of tax revenue mix on subsequent employment growth for the population of regions in a country:

,

where growth is the percentage change in employment over a ten-year period, is the share of property taxes in total tax revenue, is the share of income tax revenues, and is the share of sales tax revenues. All of these variables are measured in 1980. The omitted share, , includes fees and miscellaneous taxes. By definition, the four shares add up to one. Other factors would include expenditures on education, infrastructure, and so on (all measured in 1980). Why must we omit one of the tax share variables from the equation? And Give a careful interpretation of .

1. \*\*Suppose that you are interested in estimating the ceteris paribus relationship between y and x1. For this purpose, you can collect data on two control variables, x2 and x3. (For concreteness, you might think of y as final exam score, x1 as lecture attendance, x2 as GPA up through the previous semester, and x3 as SAT or ACT score.) Let be the simple regression estimate from y on x1 and let be the multiple regression estimate from y on x1, x2, x3.

If x1 is highly correlated with x2 and x3 in the sample, and x2 and x3 have large partial effects on y, would you expect and to be similar or very different? Explain.

1. \*\*What is the normality assumption about? Explain the essence, mainly.
2. \*How the t-test is conducted? Explain with the definitions of the terms.
3. \*What is the p-value of the coefficient and how it defines the statistical significance?
4. \*\*\*Suppose you have the following model and you are interested in joint effect of trade turnover of Georgia and Russia with Azerbaijan on Azerbaijan GDP:

GDP – is Azerbaijan GDP;

tradeGEO – is trade turnover of Georgia with Azerbaijan;

tradeRUS – is trade turnover of Russia with Azerbaijan;

exchangerate – AZN per USD;

How would you formulate your hypothesis and your model in order to find the joint effects of two independent variables in the initial regression model?

1. \*\*How is the joint significance of more than one independent variables checked in the models? What kind of test is used? Explain it clearly.
2. \*\*What is the F-statistic about? Why is it always positive? Explain it clearly.
3. \*\*\*Problem solving: F-test;
4. \*\*\*Problem solving: model explanation and comparison with some models (based on their SSR`s);
5. \*\* Problem solving: model explanation and comparison with some models (based on their R-sqaured);
6. \*\*Consider an equation to explain salaries of CEOs in terms of annual firm sales, return on equity (roe, in percentage form), and return on the firm`s stock (ros, in percentage form):

In terms of model parameters, state the null hypothesis that, after controlling for sales and roe, ros has no effect on CEO salary. State the alternative that better stock market performance increases a CEO`s salary.

1. \*Problem solving: interpretation of the coefficients;
2. \*\*Consider the multiple regression model with three independent variables, under the classical linear model assumptions MLR.1 through MLR.6 (6 assumptions):

You would like to test the null hypothesis:

Define and . Write regression equation involving , , and that allows you to directly obtain .

1. \*\*\*In the simple regression model under Gauss Markov assumptions, we argued that the slope estimator, , is consistent for . Prove that plim=.

Hint\*: You need to use the consistency of , and the law of large numbers.

1. \*The following model allows the return to education to depend upon the total amount of the parents’ education, called pareduc:

Show that the proportionate effect on wage of another year of education is .

1. \*Problem solving: model solving – finding the value for dependent variable based on the values of independent variable;
2. \*\*Problem solving: model solving - dependence of independent variable on dependent variable;
3. \*Suppose we want to estimate the effects of alcohol consumption (alcohol) on university grade point average (uniGPA). In addition to collecting information on grade point averages and alcohol usage, we also obtain attendance information (say, percentage of lectures at‑ tended, called attend). A standardized test score (say, SAT) and post-sixteen GPA (psGPA) are also available.

Should SAT and psGPA be included as explanatory variables? Explain why and how would you check whether it would better to add them.

1. \*What is the dummy variable about? Give an example using dummy in the regression and explain the model.
2. \*There is a give model below. Explain the case when d=1 and d=0 in the graph. What is the additional value in the model when d=1?
3. \*\*Problem solving: t-test in the regression including dummy variables;
4. \*\*Problem solving: t-test in the regression including dummy variables;
5. \*\* Problem solving: t-test in the regression including dummy variables;
6. \*\* Problem solving: dummy variables;
7. \* What is heteroskedasticity? Why is it important to have it, although there is unbiased and consistent OLS estimates without this assumption?
8. \*\*What are the consequences of heteroskedasticity? Explain it clearly.
9. \*\*\*Prove that , when there is homoscedasticity.
10. \*\*\*Derive the equation of  when there is heteroskedasticy in the regression.
11. \*\*Explain how to test the heteroskedasticity? What are the well-known tests for that to use and their differences?
12. \*\*\*Consider a linear model to explain monthly beer consumption:

Write the transformed equation that has a homoskedastic error term and explain how you came up with that equation.

1. \*\* Problem solving: multiple regression – misspecified model;
2. \*\*\*There are different ways to combine features of the Breusch-Pagan and White tests for heteroskedasticity. One possibility not covered in the text is to run the regression

where the are the OLS residuals and the are the OLS fitted values. Then, we would test joint significance of Xi1, Xi2, …, Xik and . (Of course, we always include an intercept in this regression.)

Explain why the R-squared from the regression above will always be at least as large as the R-squareds for the BP regression and the special case of the White test.

1. \*What tests are used in order to detect general functional form misspecification? Explain the conduction of the test on the example.
2. \*What is the difference between nested and nonnested models? What tests are used to detect the right functional forms of these models? Explain it clearly.
3. \*How to test against nonnested models? What approaches there are? Explain them.
4. \*Consider that the model is misspecified due to the unavailable data of an independent variable. What method is needed to be used to solve the misspecification? Explain the method and the way solved the problem clearly.
5. \*Let math10 denote the percentage of students at a Michigan high school receiving a passing score on a standardized math test. We are interested in estimating the effect of per student spending on math performance. A simple model is

where poverty is the percentage of students living in poverty. The variable lnchprg is the percentage of students eligible for the federally funded school lunch program. Why is this a sensible proxy variable for poverty?

1. \*What is the difference between time-series and cross sectional analysis? Give a data samples for both and show the difference on their data as well.
2. \*\*State the Gauss-Markov assumptions for time series analysis and explain each of them briefly. Show the difference of those with that of Gauss-Markov assumptions of cross sectional analysis as well.
3. \*Assume that the dependent and independent variables are trending together over time. Why the relationship is not always causal? Identify the reasons and solutions for that.
4. \*\*Problem solving: F-test;
5. \*What are stationary and non-stationary processes about? Explain the difference and each element in it.
6. \*\*Explain the weakly dependent time series analysis in terms of covariance stationary process. Why it is important to have weak dependence in time series analysis?