**Quliyev Rövşən\_Ekonometrika**

1. **Elements of theory of probability and statistics.**
2. Types of uncertainty.
3. Definition of cross-sectional, time series, and panel data.
4. Discrete and continuous random variables (RV).
5. Mean, median, mode of RV.
6. Range, Variance, variation coefficient.
7. Covariance, Correlation coefficient.
8. **Calculation of the main characteristics of population and sample.**
9. The observations of X and Y are given. Find their means, medians, variance, covariance and correlation coefficients.

|  |  |  |
| --- | --- | --- |
|  | **X** | **Y** |
|  | 1 | 8 |
|  | 2 | 1 |
|  | 3 | 6 |
|  | 4 | 2 |
| Mean |  |  |
| Median |  |  |
| Variance |  |  |
| Variation coefficient |  |  |
| Covar |  |  |
| Corr |  |  |

1. The observations of X and Y are given. Find their means, medians, variance, covariance and correlation coefficients.

|  |  |  |
| --- | --- | --- |
|  | **X** | **Y** |
|  | 4 | 3 |
|  | 2 | 2 |
|  | 3 | 6 |
|  | 6 | 7 |
| Mean |  |  |
| Median |  |  |
| Variance |  |  |
| Variation coefficient |  |  |
| Covar |  |  |
| Corr |  |  |

1. The observations of X and Y are given. Find their means, medians, variance, covariance and correlation coefficients.

|  |  |  |
| --- | --- | --- |
|  | **X** | **Y** |
|  | 8 | 3 |
|  | 1 | 2 |
|  | 6 | 6 |
|  | 2 | 7 |
| Mean |  |  |
| Median |  |  |
| Variance |  |  |
| Variation coefficient |  |  |
| Covar |  |  |
| Corr |  |  |

1. The observations of X and Y are given. Find their means, medians, variance, covariance and correlation coefficients.

|  |  |  |
| --- | --- | --- |
|  | **X** | **Y** |
|  | 2 | 4 |
|  | 3 | 2 |
|  | 4 | 2 |
|  | 8 | 5 |
| Mean |  |  |
| Median |  |  |
| Variance |  |  |
| Variation coefficient |  |  |
| Covar |  |  |
| Corr |  |  |

1. The observations of X and Y are given. Find their means, medians, variance, covariance and correlation coefficients.

|  |  |  |
| --- | --- | --- |
|  | **X** | **Y** |
|  | 3 | 4 |
|  | 5 | 6 |
|  | 8 | 7 |
|  | 9 | 8 |
| Mean |  |  |
| Median |  |  |
| Variance |  |  |
| Variation coefficient |  |  |
| Covar |  |  |
| Corr |  |  |

1. **Simple regression analysis**
2. Simple regression problem formulation.
3. Estimation problem.
4. Ordinary least square method.
5. Gauss–Markov assumptions.
6. Interpretation of SRM coefficients.
7. **Properties of the regression coefficients.**
8. Unbiasedness of SRM coefficients.
9. Estimating variances of SRM coefficients.
10. Properties of the regression coefficients.
11. Determination coefficient.
12. Standard deviations and standard errors of te SRM coefficients.
13. **Problems analyzing on SRM and problems solving.**
14. The observations of X and Y are given. Find SRM coefficients and their standard errors.

|  |  |  |
| --- | --- | --- |
|  | **X** | **Y** |
|  | 1 | 8 |
|  | 2 | 1 |
|  | 3 | 6 |
|  | 4 | 2 |
| b1 |  |  |
| b2 |  |  |
| s.e. (b1) |  |  |
| s.e. (b2) |  |  |

1. The observations of X and Y are given. Find SRM coefficients and their standard errors.

|  |  |  |
| --- | --- | --- |
|  | **X** | **Y** |
|  | 4 | 3 |
|  | 2 | 2 |
|  | 3 | 6 |
|  | 6 | 7 |
| b1 |  |  |
| b2 |  |  |
| s.e. (b1) |  |  |
| s.e. (b2) |  |  |

1. The observations of X and Y are given. Find SRM coefficients and their standard errors.

|  |  |  |
| --- | --- | --- |
|  | **X** | **Y** |
|  | 8 | 3 |
|  | 1 | 2 |
|  | 6 | 6 |
|  | 2 | 7 |
| b1 |  |  |
| b2 |  |  |
| s.e. (b1) |  |  |
| s.e. (b2) |  |  |

1. The observations of X and Y are given. Find SRM coefficients and their standard errors.

|  |  |  |
| --- | --- | --- |
|  | **X** | **Y** |
|  | 2 | 4 |
|  | 3 | 2 |
|  | 4 | 2 |
|  | 8 | 5 |
| b1 |  |  |
| b2 |  |  |
| s.e. (b1) |  |  |
| s.e. (b2) |  |  |

1. The observations of X and Y are given. Find SRM coefficients and their standard errors.

|  |  |  |
| --- | --- | --- |
|  | **X** | **Y** |
|  | 3 | 4 |
|  | 5 | 6 |
|  | 8 | 7 |
|  | 9 | 8 |
| b1 |  |  |
| b2 |  |  |
| s.e. (b1) |  |  |
| s.e. (b2) |  |  |

1. **Hypothesis testing SRM coefficients.**
2. Formulation of hypothesis testing problem in econometrics.
3. Type I error
4. Type II error.
5. z and t-tables.
6. Problems analyzing.
7. **P-value. Confidence interval. F-test**
8. z and t-tests.
9. P-value.
10. One-sided *t* tests.
11. Confidence interval.
12. F-test.
13. **Problems analyzing on SRM and problems solving.**
14. With given values of significance level, Standard deviation, Standard error, regression coefficients, number of observations, null hypothesis N0: β = β20 find the according statistical characteristics and test the hypothesis.

|  |  |  |
| --- | --- | --- |
| Significance level | 1% |  |
| Standard deviation | 2 |  |
| Standard error | 1,8 |  |
| b2 | 16 |  |
| β20 | 11 |  |
| number of observations | 20 |  |
|   |   | **testing** |
| z-critical 2-side |  |  |
| z-critical 1-side |  |  |
| right-side TS acceptance region (z-stat) |  |  |
| df |  |  |
| t-critical 2-side |  |  |
| t-critical 1-side |  |  |
| right-side TS acceptance region (t-stat) |  |  |
| z-statistics |  |  |
| t-statistics |  |  |
| z-confidence interval |  |  |
| t-confidence interval |  |  |

1. With given values of significance level, Standard deviation, Standard error, regression coefficients, number of observations, null hypothesis N0: β = β20 find the according statistical characteristics and test the hypothesis.

|  |  |  |
| --- | --- | --- |
| Significance level | 5% |  |
| Standard deviation | 3 |  |
| Standard error | 2,5 |  |
| b2 | 25 |  |
| β20 | 20 |  |
| number of observations | 40 |  |
|   |   | **testing** |
| z-critical 2-side |  |  |
| z-critical 1-side |  |  |
| right-side TS acceptance region (z-stat) |  |  |
| df |  |  |
| t-critical 2-side |  |  |
| t-critical 1-side |  |  |
| right-side TS acceptance region (t-stat) |  |  |
| **z-statistics** |  |  |
| **t-statistics** |  |  |
| **z-confidence interval** |  |  |
| **t-confidence interval** |  |  |

1. With given values of significance level, Standard deviation, Standard error, regression coefficients, number of observations, null hypothesis N0: β = β20 find the according statistical characteristics and test the hypothesis.

|  |  |  |
| --- | --- | --- |
| Significance level | 1% |  |
| Standard deviation | 3 |  |
| Standard error | 2,5 |  |
| b2 | 25 |  |
| β20 | 18 |  |
| number of observations | 40 |  |
|   |   | **testing** |
| z-critical 2-side |  |  |
| z-critical 1-side |  |  |
| right-side TS acceptance region (z-stat) |  |  |
| df |  |  |
| t-critical 2-side |  |  |
| t-critical 1-side |  |  |
| right-side TS acceptance region (t-stat) |  |  |
| **z-statistics** |  |  |
| **t-statistics** |  |  |
| **z-confidence interval** |  |  |
| **t-confidence interval** |  |  |

1. With given values of significance level, Standard deviation, Standard error, regression coefficients, number of observations, null hypothesis N0: β = β20 find the according statistical characteristics and test the hypothesis.

|  |  |  |
| --- | --- | --- |
| Significance level | 5% |  |
| Standard deviation | 3 |  |
| Standard error | 2,5 |  |
| b2 | 29 |  |
| β20 | 35 |  |
| number of observations | 40 |  |
|   |   | **testing** |
| z-critical 2-side |  |  |
| z-critical 1-side |  |  |
| left-side TS acceptance region (z-stat) |  |  |
| df |  |  |
| t-critical 2-side |  |  |
| t-critical 1-side |  |  |
| leftt-side TS acceptance region (t-stat) |  |  |
| **z-statistics** |  |  |
| **t-statistics** |  |  |
| **z-confidence interval** |  |  |
| **t-confidence interval** |  |  |

1. With given values of significance level, Standard deviation, Standard error, regression coefficients, number of observations, null hypothesis N0: β = β20 find the according statistical characteristics and test the hypothesis.

|  |  |  |
| --- | --- | --- |
| Significance level | 1% |  |
| Standard deviation | 3 |  |
| Standard error | 2,5 |  |
| b2 | 25 |  |
| β20 | 19 |  |
| number of observations | 40 |  |
|   |   | **testing** |
| z-critical 2-side |  |  |
| z-critical 1-side |  |  |
| right-side TS acceptance region (z-stat) |  |  |
| df |  |  |
| t-critical 2-side |  |  |
| t-critical 1-side |  |  |
| right-side TS acceptance region (t-stat) |  |  |
| **z-statistics** |  |  |
| **t-statistics** |  |  |
| **z-confidence interval** |  |  |
| **t-confidence interval** |  |  |

1. **Multiple regression analysis**
2. Formulation of multiple regression problem (Multiple regression problem).
3. Gauss–Markov assumptions for SRP.
4. Properties of the multiple regression coefficients.
5. Precision of the multiple regression coefficients.
6. Problem of multicollinearity.
7. **Alleviation of multicollinearity**
8. Methods for alleviation of multicollinearity.
9. Including further relevant variables in the model.
10. Combining the correlated variables for alleviation of multicollinearity.
11. Excluding irrelevant variables.
12. F-test for multiple regression model
13. **Heteroscedasticity.**
14. Heteroscedasticity.
15. Causes and consequences of heteroscedasticity.
16. Disclosure of heteroscedasticity.
17. Goldfeld–Quandt test for heteroscedasticity
18. Heteroscedasticity: weighted and logarithmic regressions.
19. **Models using time series data**
20. Time series models: static models and models with lags.
21. Adaptive expectations.
22. Adaptive expectations: Friedman's permanent income hypothesis.
23. Partial adjustment.
24. Prediction.
25. **Properties of regression models with time series data**
26. Assumptions for model C: regressions with time series data.
27. Assumption C.7.
28. Durbin–Watson test for AR(1) autocorrelation.
29. Eliminating AR(1) autocorrelation.
30. Autocorrelation in a model with a lagged dependent variable.
31. **E-views report analyzing.**
32. Analyze the E-views report:

|  |  |  |
| --- | --- | --- |
| Dependent Variable: USAGE |  |  |
| Method: Least Squares |  |  |
| Sample: 1 32 |  |  |  |
| Included observations: 32 |  |  |
| USAGE=C(1)+C(2)\*LOG(SCORE\_EF) |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Coefficient | Std. Error | t-Statistic | Prob.   |
|  |  |  |  |  |
|  |  |  |  |  |
| C(1) | -22.03558 | 29.58002 | -0.744948 | 0.4621 |
| C(2) | 19.17141 | 7.811115 | 2.454376 | 0.0201 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.167221 |     Mean dependent var | 50.09375 |
| Adjusted R-squared | 0.139462 |     S.D. dependent var | 20.51649 |
| S.E. of regression | 19.03217 |     Akaike info criterion | 8.790600 |
| Sum squared resid | 10866.70 |     Schwarz criterion | 8.882208 |
| Log likelihood | -138.6496 |     Hannan-Quinn criter. | 8.820965 |
| F-statistic | 6.023959 |     Durbin-Watson stat | 1.996136 |
| Prob(F-statistic) | 0.020134 |  |  |  |

1. Analyze the E-views report:

|  |  |  |
| --- | --- | --- |
| Dependent Variable: USAGE |  |  |
| Method: Least Squares |  |  |
| Sample: 1 32 |  |  |  |
| Included observations: 32 |  |  |
| USAGE=C(1)+C(2)\*POP2CAP+C(3)\*CAP2WAGE+C(4)\*SCORE\_EF |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Coefficient | Std. Error | t-Statistic | Prob.   |
|  |  |  |  |  |
|  |  |  |  |  |
| C(1) | 35.16416 | 10.03267 | 3.504965 | 0.0016 |
| C(2) | -0.037832 | 0.026079 | -1.450639 | 0.1580 |
| C(3) | -0.320381 | 0.138281 | -2.316872 | 0.0280 |
| C(4) | 0.799146 | 0.202168 | 3.952879 | 0.0005 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.366546 |     Mean dependent var | 50.09375 |
| Adjusted R-squared | 0.298676 |     S.D. dependent var | 20.51649 |
| S.E. of regression | 17.18156 |     Akaike info criterion | 8.642019 |
| Sum squared resid | 8265.768 |     Schwarz criterion | 8.825236 |
| Log likelihood | -134.2723 |     Hannan-Quinn criter. | 8.702750 |
| F-statistic | 5.400693 |     Durbin-Watson stat | 2.014804 |
| Prob(F-statistic) | 0.004636 |  |  |  |

1. Analyze the E-views report:

|  |  |  |
| --- | --- | --- |
| Dependent Variable: USAGE |  |  |
| Method: Least Squares |  |  |
| Sample: 1 32 |  |  |  |
| Included observations: 32 |  |  |
| USAGE=C(1)+C(2)\*SCORE\_EF |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Coefficient | Std. Error | t-Statistic | Prob.   |
|  |  |  |  |  |
|  |  |  |  |  |
| C(1) | 23.71789 | 9.038745 | 2.624024 | 0.0135 |
| C(2) | 0.563813 | 0.180672 | 3.120639 | 0.0040 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.245063 |     Mean dependent var | 50.09375 |
| Adjusted R-squared | 0.219898 |     S.D. dependent var | 20.51649 |
| S.E. of regression | 18.12086 |     Akaike info criterion | 8.692466 |
| Sum squared resid | 9850.967 |     Schwarz criterion | 8.784075 |
| Log likelihood | -137.0795 |     Hannan-Quinn criter. | 8.722832 |
| F-statistic | 9.738390 |     Durbin-Watson stat | 2.003161 |
| Prob(F-statistic) | 0.003970 |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

1. Analyze the E-views report:

|  |  |  |
| --- | --- | --- |
| Dependent Variable: VISIT |  |  |
| Method: Least Squares |  |  |
| Sample: 1 32 |  |  |  |
| Included observations: 32 |  |  |
| VISIT=C(1)+C(2)\*SCORE\_EF |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Coefficient | Std. Error | t-Statistic | Prob.   |
|  |  |  |  |  |
|  |  |  |  |  |
| C(1) | -3756.595 | 4160.651 | -0.902886 | 0.3738 |
| C(2) | 397.6660 | 83.16573 | 4.781609 | 0.0000 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.432504 |     Mean dependent var | 14846.72 |
| Adjusted R-squared | 0.413587 |     S.D. dependent var | 10892.57 |
| S.E. of regression | 8341.266 |     Akaike info criterion | 20.95628 |
| Sum squared resid | 2.09E+09 |     Schwarz criterion | 21.04789 |
| Log likelihood | -333.3005 |     Hannan-Quinn criter. | 20.98664 |
| F-statistic | 22.86379 |     Durbin-Watson stat | 1.608368 |
| Prob(F-statistic) | 0.000043 |  |  |  |

1. Analyze the E-views report:

|  |  |  |
| --- | --- | --- |
| Dependent Variable: VISIT |  |  |
| Method: Least Squares |  |  |
| Sample: 1 32 |  |  |  |
| Included observations: 32 |  |  |
| VISIT=C(1)+C(2)\*SCORE\_EF+C(3)\*POP |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  | Coefficient | Std. Error | t-Statistic | Prob.   |
|  |  |  |  |  |
|  |  |  |  |  |
| C(1) | -4801.303 | 4198.696 | -1.143522 | 0.2622 |
| C(2) | 370.8633 | 84.95473 | 4.365423 | 0.0001 |
| C(3) | 0.578248 | 0.453569 | 1.274885 | 0.2125 |
|  |  |  |  |  |
|  |  |  |  |  |
| R-squared | 0.462622 |     Mean dependent var | 14846.72 |
| Adjusted R-squared | 0.425561 |     S.D. dependent var | 10892.57 |
| S.E. of regression | 8255.667 |     Akaike info criterion | 20.96425 |
| Sum squared resid | 1.98E+09 |     Schwarz criterion | 21.10166 |
| Log likelihood | -332.4280 |     Hannan-Quinn criter. | 21.00980 |
| F-statistic | 12.48285 |     Durbin-Watson stat | 1.448068 |
| Prob(F-statistic) | 0.000123 |  |  |  |

1. **Specification of regression variables: a preliminary skirmish**
2. Consequences of variable misspecification
3. Omission of a relevant variable.
4. Inclusion of an irrelevant variable.
5. Proxy variables.
6. Testing a linear restriction