

Self-evaluation Tests

Vehicles 2

Instructions

- Click **Start**.
- Answer the questions.
- Click **End**.
- The cell

Score:

 shows the number of right answers.
- Each question is worth 1 point.
- Click **Correct** to check the correct answers.
- The test starts on the next page.
- Recommended duration: 50 minutes.

Questions

Open the data file `vehicles.gdt` to analyse the evolution of the number of registered vehicles in the Basque Country (RV) as a function of the Brent oil price (BOP , in dollars) and the Industrial Production Index of the Basque Country (annual variation rate).

$$RV_t = \beta_1 + \beta_2 BOP_t + \beta_3 IPIBCR_t + u_t$$

General Linear Regression Model

1. The OLS estimate of β_3 is:

- (a) 6502.97 (b) -44.226 (c) 50.7445 (d) 5.4233

2. The estimator of the covariance matrix of the OLS estimators is:

- (a) $\hat{V}(\hat{\beta}) = \sigma^2(X'X)^{-1}$ (b) $\hat{V}(\hat{\beta}) = \hat{\sigma}^2(X'X)^{-1}$
 (c) $\hat{V}(\hat{\beta}) = \hat{\sigma}^2(X'X)$ (d) $\hat{V}(\hat{\beta}) = \sigma^2(X'X)$

3. The estimated number of registered vehicles for May 2004 is:

- (a) 6502.97 (b) 4909.347 (c) 4286.316 (d) 5405.234

4. Assume that the price of Brent is 85 dollars and the annual rate of growth of IPI is zero. The estimated number of registered vehicles is:
- (a) 2791.1895 (b) 2743.7175 (c) 10262.22 (d) 6502.97
5. The OLS residual for the fifth observation is:
- (a) -16.038 (b) -71.928 (c) 39.766 (d) 0
6. Given the OLS estimation results:
- (a) It is estimated that the number of registered vehicles decreases by 44.2265 units when the price of Brent increases by one dollar.
- (b) It is estimated that the number of registered vehicles decreases by 44.2265 units when the price of Brent increases by one dollar, holding the annual variation rate of IPI constant.
- (c) It is estimated that the number of registered vehicles increases by 50.7445 units when the price of Brent increases by one dollar.
- (d) It is estimated that the number of registered vehicles decreases by 44.2265 units when the price of Brent increases, holding the annual variation rate of IPI constant.

7. Given the OLS estimation results:

- (a) It is estimated that the number of registered vehicles decreases by 44.2265 units when the annual variation rate of IPI increases by one point.
- (b) It is estimated that the number of registered vehicles increases by 50.7445 units when the annual variation rate of IPI increases by one point.
- (c) It is estimated that the number of registered vehicles increases by 50.7445 units when the annual variation rate of IPI increases, holding the price of Brent constant.
- (d) It is estimated that the number of registered vehicles increases by 50.7445 units when the annual variation rate of IPI increases by one point, holding the price of Brent constant.

8. It may be concluded, at the 5% significance level, that the price of Brent affects negatively the number of registered vehicles because:

$$(a) \left| \frac{-44.2265 - 0}{4.55089} \right| > t_{0.025}(105) \quad (b) \frac{-44.2265 - 0}{4.55089} < t_{0.05}(105)$$

$$(c) \left| \frac{-44.2265 - 0}{4.55089} \right| > -t_{0.025}(105) \quad (d) \frac{-44.2265 - 0}{4.55089} < -t_{0.05}(105)$$

9. It may be concluded, at the 5% significance level, that the annual variation rate of IPI is a statistically significant variable because:

$$(a) \left| \frac{50.7445 - 0}{9.35671} \right| > t_{0.05}(105)$$

$$(b) 5.423 > t_{0.025}(105)$$

$$(c) \frac{(99061922 - 77384943)/2}{77384943/(108 - 2)} > \mathcal{F}_{0.05}(2, 105)$$

$$(d) \frac{(99061922 - 77384943)/2}{99061922/(108 - 3)} > \mathcal{F}_{0.05}(2, 105)$$

10. Test the overall significance of the explanatory variables. The null hypothesis is:

$$(a) \beta_1 = \beta_2 = \beta_3 = 0$$

$$(b) \beta_1 = \beta_2 = \beta_3$$

$$(c) \beta_2 = \beta_3 = 0$$

$$(d) \beta_2 = \beta_3$$

11. It may be concluded, at the 5% significance level, that the explanatory variables are jointly significant:

$$(a) \frac{R^2/3}{(1 - R^2)/(T - k)} > \mathcal{F}_{0.05}(3, 105)$$

$$(b) \frac{R^2}{1 - R^2} > \mathcal{F}_{0.05}(2, 105)$$

$$(c) 61.85455 > \mathcal{F}_{0.05}(3, 105)$$

$$(d) \frac{R^2/2}{(1 - R^2)/(T - k)} > \mathcal{F}_{0.05}(2, 105)$$

12. An expert thinks that if the price of Brent were 92 dollars and the annual variation rate of IPI 3 points, the number of registered vehicles would be around 3000 units. Do you agree with him?

(a) No, because $3000 \notin [5957.88 \quad 7048.05]$.

(b) No, because $3000 \notin [32.19 \quad 69.29]$.

(c) Yes, because $3000 \in [846.48 \quad 4326.25]$.

(d) Yes, because 3000 is larger than the values included in the interval $[32.19 \quad 69.29]$.

- 13.** The time series plot of the OLS residuals suggests that:
- (a) The residuals are mostly positive at the end of the sample.
 - (b) The error term might be heteroskedastic because the variance of the residuals increase with time.
 - (c) The residuals do not follow a normal distribution.
 - (d) The error term might be autocorrelated because there are clusters of positive residuals followed by clusters of negative residuals.
- 14.** If the error term is autocorrelated:
- (a) The OLS estimators are BLUE.
 - (b) The OLS estimators are not efficient.
 - (c) The OLS estimators are biased and not efficient.
 - (d) It is not possible to make inference because the OLS estimator does not follow a normal distribution.
- 15.** The time series plot of the OLS residuals suggests that:
- (a) There is a change in the level of the residuals in the middle of 2010.
 - (b) The residuals are randomly distributed.
 - (c) There is not any regularity pattern.
 - (d) The sample mean of the residuals is not zero.

16. If the regression model that determines the number of registered vehicles omits a relevant variable:
- (a) The OLS estimators are BLUE.
 - (b) The OLS estimators are not efficient.
 - (c) The OLS estimators are biased and not efficient.
 - (d) It is not possible to make inference because the OLS estimator does not follow a normal distribution.
17. If the price of Brent is measured in euros instead of dollars, the Sample Regression Function is (1 euro = 1.32 dollars):
- (a) $\widehat{RV}_t = 6502.97 - 33.504924 BOP_t + 50.7445 IPIBCR$
 - (b) $\widehat{RV}_t = 6502.97 - 58.37898 BOP_t + 50.7445 IPIBCR$
 - (c) $\widehat{RV}_t = 8583.920 - 58.37898 BOP_t + 66.98274 IPIBCR$
 - (d) $\widehat{RV}_t = 4926.49242 - 33.5049 BOP_t + 38.442803 IPIBCR$
18. One of the consequences of this change of units of measurements is:
- (a) The coefficient of determination changes.
 - (b) The sum of squared residuals changes.
 - (c) The estimates of the coefficients change.
 - (d) The sample value of the statistic used to test the overall significance of the explanatory variables changes.

19. If the volume of registered vehicles is measure in thousands instead of units and the price of Brent in dollars, the sample regression function would be:

(a) $\widehat{RV}_t = 6.50297 - 0.0442265 BOP_t + 0.0507445 IPIBCR$

(b) $\widehat{RV}_t = 6502970 - 44226.5 BOP_t + 50744.5 IPIBCR$

(c) $\widehat{RV}_t = 6.50297 - 44.2265 BOP_t + 50.7445 IPIBCR$

(d) $\widehat{RV}_t = 6502970 - 44.2265 BOP_t + 50.7445 IPIBCR$

20. Given this change of units of measurement, which of these statements is false?

- (a) The estimated covariance matrix of the OLS estimators of the coefficients changes
- (b) The sum of squared residuals changes
- (c) The estimates of the coefficients change
- (d) The sample value of the statistic used to test the overall significance of the explanatory variables changes.