Self-evaluation Tests

Vehicles 3

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: 65 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), the Industrial Production Index of the Basque Country (annual rate of growth) and seasonality.

$$\begin{aligned} RV_t &= \beta_1 + \beta_2\, BOP_t + \beta_3\, IPIBCR_t + \beta_4\, dm2_t + \\ &+ \beta_5\, dm3_t + \beta_6\, dm4_t + \beta_7\, dm5_t + \beta_8\, dm6_t + \beta_9\, dm7_t + \\ &+ \beta_{10}\, dm8_t + \beta_{11}\, dm9_t + \beta_{12}\, dm10_t + \beta_{13}\, dm11_t + \\ &+ \beta_{14}\, dm12_t + u_t \end{aligned}$$

where

$$dmi_t = \begin{cases} 1 & \text{if t} \in \text{month i} \\ 0 & \text{otherwise} \end{cases} \qquad i = 2, 3, \ldots, 12$$

Start **General Linear Regression Model**

1. What is the sample mean of the number of registered vehicles in December?

(a) 3681.1 (b) 3983.463 (c) 5962.87 (d) 4211.6

2. Analysing the data set, it may be concluded that:

(a) The sample mean of the variable RV is smaller than the sample mean of the variable BOP.
(b) The volume of registered vehicles per month has reached the 9000 units.
(c) The dispersion of variables RV and BOP is very similar in terms of the coefficient of variation.
(d) The range of the variable RV is fifteen times the range of the variable BOP.

3. According to the regression model proposed, what is the expected volume of registered vehicles in December?

(a) $\beta_1 + \beta_2\, BOP_t + \beta_3\, IPIBCR_t$
(b) $\beta_1 + \beta_2\, BOP_t + \beta_3\, IPIBCR_t + \beta_{14}$
(c) β_1
(d) $\beta_1 + \beta_{14}$

4. According to the regression model proposed, what is the expected volume of registered vehicles in January?

(a) $\beta_1 + \beta_2\, BOP_t + \beta_3\, IPIBCR_t$
(b) $\beta_1 + \beta_2\, BOP_t + \beta_3\, IPIBCR_t + \beta_{14}$
(c) β_1
(d) $\beta_1 + \beta_{14}$

5. Given the OLS estimation results:

(a) It is estimated that the number of registered vehicles decreases by 45.4785 units when the price of Brent increases by one dollar.

(b) It is estimated that the number of registered vehicles decreases by 45.4785 units when the price of Brent increases by one dollar, holding the annual variation rate of IPI and seasonality constant.

(c) It is estimated that the number of registered vehicles decreases by 45.4785 units in January when the price of Brent increases by one dollar, holding the annual variation rate of IPI and seasonality constant.

(d) It is estimated that the number of registered vehicles decreases by 45.4785 units in January when the price of Brent increases by one dollar, holding the annual variation of IPI constant.

6. The OLS estimate of β_2 is:

(a) 5962.87 (b) -45.4785 (c) 50.7713 (d) 254.835

7. Given the OLS estimation results:

(a) It is estimated that 1610.33 vehicles more are registered in July than in January, holding the rest of the explanatory variables constant.

(b) The estimated difference in the number of registered vehicles between the months of January and July is 1610.33, holding constant the price of Brent and the annual variation rate of IPI.

(c) The estimated difference in the number of registered vehicles between the months of January and July is 1610.33, holding constant the price of Brent.

(d) It is estimated that the difference in the number of vehicles registered between the months of July and January is -1610.33, holding constant the price of Brent and the annual variation of IPI.

8. The estimated number of registered vehicles for May 2009 is:

(a) 3911.334 (b) 5674.555 (c) 3516.718 (d) 5962.87

9. The OLS residual for December 2011 is:

(a) -65.673 (b) -145.791 (c) -175.201 (d) -654.718

10. Given the estimation results:

(a) It is estimated that 479.862 vehicles less are registered in August, holding the rest of the explanatory variables constant.

(b) The estimated difference in the number of registered vehicles between the months of June and August is 1984.932, holding the price of Brent and the annual variation rate of IPI constant.

(c) The estimated difference in the number of registered vehicles between the months of August and June es 1984.932, holding the rest of the explanatory variables constant.

(d) It is estimated that the difference in the number of registered vehicles between the months of June and August is 1026.208, holding the price of Brent and the annual variation rate of IPI constant.

11. What is the null hypothesis to test the joint significance of the variables price of Brent and annual variation rate of IPI?

(a) $\beta_2 = \beta_3$ (b) $\beta_1 = \beta_2 = \beta_3 = 0$
(c) $\beta_2 = 0, \beta_3 = 0$ (d) $\beta_2 + \beta_3 = 0$

12. Are the variables BOP and $IPIBCR$ jointly significant? (α =5%)

(a) Yes (b) No

13. What is the null hypothesis to test whether the volume of registered vehicles presents seasonal behaviour?

(a) $\beta_1 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \ldots = \beta_{14} = 0$

(b) $\beta_4 = \beta_5 = \beta_6 = \beta_7 = \ldots = \beta_{14} = 0$

(c) $\beta_1 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \ldots = \beta_{14}$

(d) $\beta_4 = \beta_5 = \beta_6 = \beta_7 = \ldots = \beta_{14}$

14. Is seasonality a statistically significant variable? (α =5%)

(a) Yes (b) No

15. What is the null hypothesis to test the overall significance of the explanatory variables?

(a) $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \ldots = \beta_{14} = 0$

(b) $\beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \ldots = \beta_{14}$

(c) $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \ldots = \beta_{14}$

(d) $\beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \ldots = \beta_{14} = 0$

16. Are the explanatory variables jointly significant? (α =5%)

(a) Yes (b) No

17. The expected difference in the number of registered vehicles between September 2012 and January 2012, holding the rest of the factors constant, is given by:

(a) β_1 (b) $\beta_1 + \beta_{11}$ (c) β_{11} (d) $\beta_{11} - \beta_1$

18. Is this difference statistically significant? (α =5%)

(a) Yes (b) No

19. The expected difference in the number of registered vehicles between December 2012 and July 2011, holding the rest of the factors constant, is given by:

(a) β_{14} (b) $\beta_{14} + \beta_9$ (c) $\beta_{14} - \beta_9 = 0$ (d) $\beta_{14} - \beta_9$

20. Is this difference statistically significant? (α =5%)

(a) Yes (b) No

21. Could it be concluded that the same number of vehicles are registered in the months of June and July, holding the rest of the factors constant?

(a) Yes (b) No

22. What is the null hypothesis to test whether the partial effect of the price of Brent is equal to the partial effect of the annual variation rate of IPI but with opposite sign?

(a) $\beta_2 - \beta_3 = 0$ (b) $\beta_2 + \beta_3 = 0$ (c) $\beta_2 = \beta_3 = 0$ (d) $\beta_2 = \beta_3$

23. What is the statistic to test the hypothesis that the partial effect of the price of Brent is equal to the partial effect of the annual variation rate of IPI but with opposite sign?

(a) $\dfrac{R^2/2}{(1-R^2)/(T-k)} \overset{H_0}{\sim} \mathcal{F}(2, T-k)$

(b) $\dfrac{(SSR_R - SSR_{UR})/2}{(SSR_{UR})/(T-k)} \overset{H_0}{\sim} \mathcal{F}(2, T-k)$

(c) $\dfrac{(SSR_R - SSR_{UR})}{(SSCR_{UR})/(T-k)} \overset{H_0}{\sim} \mathcal{F}(1, T-k)$

(d) $\dfrac{\hat{\beta}_2 + \hat{\beta}_3}{\sqrt{\hat{\sigma}^2_{\hat{\beta}_2} + \hat{\sigma}^2_{\hat{\beta}_3}}} \overset{H_0}{\sim} t(T-k)$

24. Is the partial effect of the price of Brent equal to the partial effect of the annual variation rate of IPI but with opposite sign? (α =5%)

(a) Yes (b) No

25. Given the result obtained in the previous item, the OLS estimator

(a) Is biased and not efficient.
(b) Is unbiased.
(c) Is not useful to make valid inference.
(d) The usual estimator of its covariance matrix is biased.

26. Given the result obtained in item 24, choose a model to determine the volume of registered vehicles in the Basque Country:

(a) $RV_t = \beta_1 + \beta_2\, BOP_t + \beta_3\, IPIBCR_t + \beta_4\, dm2_t + \beta_5\, dm3_t + \ldots + \beta_{13}\, dm11_t + \beta_{14}\, dm12_t + u_t$

(b) $RV_t = \beta_1 + (\beta_2 + \beta_3)\, IPIBCR_t + \beta_4\, dm2_t + \beta_5\, dm3_t + \ldots + \beta_{13}\, dm11_t + \beta_{14}\, dm12_t + u_t$

(c) $RV_t = \beta_1 + \beta_2\, (BOP_t - IPIBCR_t) + \beta_4\, dm2_t + \beta_5\, dm3_t + \ldots + \beta_{13}\, dm11_t + \beta_{14}\, dm12_t + u_t$

(d) $RV_t = \beta_1 + \beta_2\, (BOP_t + IPIBCR_t) + \beta_4\, dm2_t + \beta_5\, dm3_t + \ldots + \beta_{13}\, dm11_t + \beta_{14}\, dm12_t + u_t$

27. Estimate by OLS the model chosen in item 26. Given the estimation results, it may be concluded that

(a) The seasonal effect is not a statistically significant.
(b) The estimated variance of the error term is: 442941.2737.
(c) The sample size has been reduced.
(d) Coefficient of determination = 71.88%.

28. The time series plot of the residuals of the model chosen in item 26 suggests that

(a) The residuals are randomly distributed.
(b) There is a change in the level of the residuals from the middle of 2010 onwards.
(c) The residuals show a seasonal pattern.
(d) There residuals do not show any regularity pattern.

End | Correct