Self-evaluation Tests

Vehicles 5

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 petrol price (BOP, in dollars), the Industrial Production Index of the Basque Country (annual variation rate) and seasonality. Furthermore, include in the model both the effect of the economic crisis and the effect of the PIVE plan implemented by the government to impulse car sales.

$$\begin{aligned} RV_t &= \beta_1 + \beta_2\, BOP_t + \beta_3\, IPIBCR_t + \beta_4\, dm2_t + \\ &+ \beta_5\, dm3_t + \beta_6\, dm4_t + \beta_7\, dm5_t + \beta_8\, dm6_t + \beta_9\, dm7_t + \\ &+ \beta_{10}\, dm8_t + \beta_{11}\, dm9_t + \beta_{12}\, dm10_t + \beta_{13}\, dm11_t + \\ &+ \beta_{14}\, dm12_t + \beta_{15}\, crisis_t + \beta_{16}\, PIVE_t + u_t \end{aligned}$$

where variables $dmi, i = 2, 3, \ldots, 12$, $crisis$ and $PIVE$ are defined in the data file `vehicles.gdt`.

Start **General Linear Regression Model**

1. What is the null hypothesis to test that the effect of the PIVE plan counteracts the effect of the crisis, holding the rest of the factors constant?

(a) $\beta_{15} = \beta_{16} = 0$
(b) $\beta_{15} = \beta_{16}$
(c) $\beta_{15} + \beta_{16} = 0$
(d) $\beta_{15} + \beta_{16} = 1$

2. What is the statistic to test that the effect of the PIVE plan counteracts the effect of the crisis, holding the rest of the factors constant?

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

(b) $$\frac{\hat{\beta}_{15} + \hat{\beta}_{16} - 1}{\sqrt{\hat{\sigma}^2_{\hat{\beta}_{15}} + \hat{\sigma}^2_{\hat{\beta}_{16}} + 2\hat{cov}(\hat{\beta}_{15}\hat{\beta}_{16})}} \overset{H_0}{\sim} t(T-k)$$

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

(d) $$\frac{\hat{\beta}_{15} + \hat{\beta}_{16} - 0}{\sqrt{\hat{\sigma}^2_{\hat{\beta}_{15}} + \hat{\sigma}^2_{\hat{\beta}_{16}} + 2\widehat{cov}(\hat{\beta}_{15}, \hat{\beta}_{16})}} \overset{H_0}{\sim} t(T-k)$$

3. Does the effect of the PIVE plan counteract the effect of the crisis, holding the rest of the factors constant? (α =5%)

(a) Yes (b) No

4. The government is thinking in running a PIVE2 plan expecting to reach the number of 3500 registered vehicles in January 2013. Taking into account that the economic crisis is not over yet and that the expected values in January 2013 for the price of Brent and the annual variation rate of IPI are 85 dollars and -4 points respectively, do you think that the government is going to reach its objective?

(a) Yes, because 3500 is larger than the upper bound of the interval [1326.98 2842.57]
(b) Yes, because $3500 \in$ [1888.61 3982.07]
(c) Yes, because $3500 \in$ [2174.70 4253.39]
(d) Yes, because $3500 \in$ [2526.3 3927.433]

5. Could it be concluded that the economic crisis has reduced the volume of registered vehicles in 3000 units? (α =5%)

(a) Yes, because $-9.458 < -t_{0.05}(92)$
(b) No, because $9.458 > t_{0.025}(92)$
(c) No, because $-9.820 < -t_{0.05}(92)$
(d) Yes, because $9.458 > t_{0.025}(92)$

6. Is there any evidence in the sample that the PIVE plan has increased the volume of registered vehicles more than 3000 units? (α =5%)

(a) Yes, because $|6.346| > t_{0.025}(92)$
(b) Yes, because $9.0117 > t_{0.05}(92)$
(c) Yes, because $|9.0117| > t_{0.025}(92)$
(d) Yes, because $6.346 > t_{0.05}(92)$

7. Could it be concluded that 1500 vehicles less are registered in August than in July? (α =5%)

(a) Yes, because $7.3841 > \mathcal{F}_{0.05}(1, 92)$
(b) No, because $7.3841 > \mathcal{F}_{0.05}(1, 92)$
(c) Yes, because $|-2.717| > t_{0.025}(92)$
(d) No, because $|-2.717| > t_{0.05}(92)$

8. The lower limit estimated for the difference in the number of registered vehicles between the months of August and in January is: (α =5%)

(a) -1055.84 (b) -621.96 (c) -596.35 (d) -169.845

9. The upper limit estimated for the decrease in the number of registered vehicles due to the economic crisis is: (α =5%)

(a) -1837.21 (b) -1542.75 (c) -1219.06 (d) -1246.46

10. The upper limit estimated for the increase in the number of registered vehicles due to the PIVE plan is: (α =5%)

(a) 851.669 (b) 1218.12 (c) 1627.60 (d) 1811.52

11. The time series plot of the residuals suggest that:

(a) There are clusters of positive residuals followed by clusters of negative residuals.
(b) There is not any regularity pattern.
(c) There is a change in the level of the residuals from the middle of 2010 onwards.
(d) The residuals show seasonal behaviour.

12. Test the presence of first order positive autocorrelation in the error term using the Durbin-Watson test. What is the alternative hypothesis in this case?

(a) $u_t = \rho u_{t-1}$
(b) $u_t = \rho u_{t-1} + \nu_t \quad \rho > 0$
(c) $\hat{u}_t = \rho \hat{u}_{t-1} + \nu_t \quad \rho > 0$
(d) $\hat{u}_t = \rho \hat{u}_{t-1}$

13. Test the presence of first order positive autocorrelation in the error term using the Durbin-Watson test. What is the test statistic?

(a) $DW = \dfrac{\sum_{t=2}^{T} (\hat{u}_t - \hat{u}_{t-1})^2}{\sum_{t=1}^{T} \hat{u}_t^2}$

(b) $DW = \dfrac{\sum_{t=2}^{T} (\hat{u}_t - \hat{u}_{t-1})^2}{\sum_{t=1}^{T} \hat{u}_{t-1}^2}$

(c) $DW = \dfrac{\sum_{t=2}^{T} \hat{u}_{t-1}^2}{\sum_{t=1}^{T} \hat{u}_t^2}$

(d) $DW = \dfrac{\sum_{t=2}^{T} \hat{u}_t - \hat{u}_{t-1}}{\sum_{t=1}^{T} \hat{u}_t^2}$

14. Is there any evidence in the sample of first order positive autocorrelation in the error term? (α =5%)

(a) Yes, because $DW = 1.567416 > d_L = 1.3846$.

(b) No, because $d_L = 1.3846 < DW = 1.5567416$.

(c) Yes, because the p-value for the Durbin-Watson test is p = 0.00707149.

(d) No, because the p-value for the Durbin-Watson test is p = 0.00707149.

15. Test the presence of autocorrelation up to order 12 in the error term. What is the auxiliary regression used in the Breusch-Godfrey test?

(a) $\hat{u}_t = \beta_1 + \delta_1 \hat{u}_{t-1} + \delta_2 \hat{u}_{t-2} + \delta_3 \hat{u}_{t-3} + \ldots + \delta_{12} \hat{u}_{t-12} + v_t$

(b) $\hat{u}_t = \beta_1 + \beta_2\, BOP_t + \beta_3\, IPI_t + \beta_4\, dm2_t + \beta_5\, dm3_t + \beta_6\, dm4_t + \beta_7\, dm5_t + \ldots + \beta_{12}\, dm19_t + \beta_{13}\, dm11_t + \beta_{14}\, dm12_t + \beta_{15}\, crisis_t + \beta_{16}\, PIVE_t + \delta_1 \hat{u}_{t-1} + \delta_2 \hat{u}_{t-2} + \delta_3 \hat{u}_{t-3} + \ldots + \delta_{12} \hat{u}_{t-12} + v_t$

(c) $u_t = \beta_1 + \delta_1 \hat{u}_{t-1} + \delta_2 \hat{u}_{t-2} + \delta_3 \hat{u}_{t-3} + \ldots + \delta_{12} \hat{u}_{t-12} + v_t$

(d) $\hat{u}_t^2 = \beta_1 + \beta_2\, BOP_t + \beta_3\, IPI_t + \beta_4\, dm2_t + \beta_5\, dm3_t + \beta_6\, dm4_t + \beta_7\, dm5_t + \ldots + \beta_{12}\, dm19_t + \beta_{13}\, dm11_t + \beta_{14}\, dm12_t + \beta_{15}\, crisis_t + \beta_{16}\, PIVE_t + \delta_1 \hat{u}_{t-1} + \delta_2 \hat{u}_{t-2} + \delta_3 \hat{u}_{t-3} + \ldots + \delta_{12} \hat{u}_{t-12} + v_t$

16. Test the presence of autocorrelation up to order 12 in the error term. What is the null hypothesis in the Breusch-Godfrey test?

(a) $\delta_{12} = 0$.
(b) $\delta_1 = 0$.
(c) $\delta_1 = \delta_2 = \ldots = \delta_{12} = 0$.
(d) $\delta_1 = \delta_2 = \ldots = \delta_{12}$.

17. Test the presence of autocorrelation up to order 12 in the error term. What is the test statistic in the Breusch-Godfrey test?

(a) $\frac{SSE}{2}$

(b) TR^2

(c) $\frac{SSR}{T-k}$

(d) $\mathcal{F}/2$

18. Is there any evidence in the sample of the presence of autocorrelation up to order 12 in the error term? (α =5%)

(a) Yes

(b) No

19. Given the results obtained in the Durbin-Watson and Breusch-Godfrey tests about the presence of autocorrelation in the error term, what are the properties of the OLS estimators?

(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 use the OLS estimator of β to make inference.

20. Given the results obtained in the Durbin-Watson and Breusch-Godfrey tests about the presence of autocorrelation in the error term, what is the estimator of the covariance matrix of the OLS estimator of β valid to make inference?

(a) $\hat{\sigma}^2(X'X)^{-1}$

(b) $(X'X)^{-1}X'\Sigma X(X'X)^{-1}$

(c) The estimator of the covariance matrix of the OLS estimator robust to autocorrelation proposed by Newey-West.

(d) The estimator of the covariance matrix of the OLS estimator robust to heteroskedasticiy proposed by White.

End

Correct