Self-evaluation Tests

Simple Regression Model I

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: 30 minutes.

Questions

Consider the simple regression models:

$$Y_t = \beta_1 + \beta_2 X_t + u_t \qquad t = 1, 2, \ldots, 57 \qquad (1)$$

$$X_t = \alpha_1 + \alpha_2 Y_t + v_t \qquad t = 1, 2, \ldots, 57 \qquad (2)$$

1. What is the dependent variable in model (1)?

  (a) u (b) Y (c) β_2 (d) X

2. What is the explanatory variable in model (1)?

  (a) u (b) Y (c) β_2 (d) X

3. What is the dependent variable in model (2)?

  (a) u (b) Y (c) β_2 (d) X

4. What is the explanatory variable in model (2)?

  (a) u (b) Y (c) β_2 (d) X

5. What is the OLS estimator of β_1 in model (1)?

(a) $\hat{\beta}_1 = \bar{X} + \hat{\beta}_2 \bar{Y}$ (b) $\hat{\beta}_1 = \bar{Y} + \hat{\beta}_2 \bar{X}$

(c) $\hat{\beta}_1 = \bar{X} - \hat{\beta}_2 \bar{Y}$ (d) $\hat{\beta}_1 = \bar{Y} - \hat{\beta}_2 \bar{X}$

6. What is the OLS estimator of β_2 in model (1)?

(a) $\hat{\beta}_2 = \dfrac{\sum Y_t X_t}{\sum X_t^2}$ (b) $\hat{\beta}_2 = \dfrac{\sum Y_t X_t}{\sum Y_t^2}$

(c) $\hat{\beta}_2 = \dfrac{\sum (Y_t - \bar{Y})(X_t - \bar{X})}{\sum (X_t - \bar{X})^2}$ (d) $\hat{\beta}_2 = \dfrac{\sum (Y_t - \bar{Y})(X_t - \bar{X})}{\sum (Y_t - \bar{Y})^2}$

7. What is the OLS estimator of α_1 in model (2)?

(a) $\hat{\alpha}_1 = \bar{X} + \hat{\alpha}_2 \bar{Y}$ (b) $\hat{\alpha}_1 = \bar{Y} + \hat{\alpha}_2 \bar{X}$

(c) $\hat{\alpha}_1 = \bar{X} - \hat{\alpha}_2 \bar{Y}$ (d) $\hat{\alpha}_1 = \bar{Y} - \hat{\alpha}_2 \bar{X}$

8. What is the OLS estimator of α_2 in model (2)?

(a) $\hat{\alpha}_2 = \dfrac{\sum Y_t X_t}{\sum X_t^2}$ (b) $\hat{\alpha}_2 = \dfrac{\sum Y_t X_t}{\sum Y_t^2}$

(c) $\hat{\alpha}_2 = \dfrac{\sum (Y_t - \bar{Y})(X_t - \bar{X})}{\sum (X_t - \bar{X})^2}$ (d) $\hat{\alpha}_2 = \dfrac{\sum (Y_t - \bar{Y})(X_t - \bar{X})}{\sum (Y_t - \bar{Y})^2}$

9. Which property of the sample regression function is not satisfied in model (2)?

(a) The properties are all satisfied

(b) $\sum Y_t \, \hat{v}_t = 0$

(c) $\sum \hat{X}_t \, \hat{v}_t = 0$

(d) SST = SSE + SSR

10. Choose the true statement:

(a) $R^2(2) > R^2(1)$

(b) $R^2(2) < R^2(1)$

(c) $R^2(2) = \dfrac{1}{R^2(1)}$

(d) $R^2(2) = R^2(1)$

11. Choose the true statement:

(a) $\hat{\alpha_2} = \hat{\beta}_2$

(b) $\hat{\alpha_2} = \dfrac{1}{\hat{\beta}_2}$

(c) SSR(2) = SSR (1)

(d) $\hat{\alpha_1} \neq \hat{\beta}_1$

Consider the regression model:

$$Y_t = \gamma \, X_t + u_t \qquad t = 1, 2, \ldots, 57 \qquad (3)$$

12. What is the OLS estimator of γ in model (3)?

(a) $\hat{\gamma} = \dfrac{\sum Y_t \, X_t}{\sum X_t^2}$

(b) $\hat{\gamma} = \dfrac{\sum Y_t \, X_t}{\sum Y_t^2}$

(c) $\hat{\gamma} = \dfrac{\sum (Y_t - \bar{Y}) \, (X_t - \bar{X})}{\sum (X_t - \bar{X})^2}$

(d) $\hat{\gamma} = \dfrac{\sum (Y_t - \bar{Y}) \, (X_t - \bar{X})}{\sum (Y_t - \bar{Y})^2}$

13. Which property of the sample regression function is NOT satisfied in model (3)?

(a) The properties are all satisfied

(b) $\sum X_t \, \hat{u}_t = 0$

(c) $\sum \hat{Y}_t \, \hat{u}_t = 0$

(d) SST = SSE + SSR

14. Choose the true statement:

(a) $R^2 = 1 - \dfrac{SSR}{SST}$

(b) $R^2 = \dfrac{SSE}{SSR}$

(c) $R^2 = \dfrac{\sum (\hat{Y}_t - \bar{\hat{Y}})^2}{\sum (Y_t - \bar{Y})^2}$

(d) $R^2 = \dfrac{\sum \hat{u}_t^2}{\sum (Y_t - \bar{Y})^2}$

15. Compare models (1) and (3) and choose the true statement:

   (a) $\hat{\gamma} = \hat{\beta}_2$ (b) $\hat{\gamma} \neq \hat{\beta}_2$ (c) $\hat{\gamma} > \hat{\beta}_2$ (d) $\hat{\gamma} < \hat{\beta}_2$