

DESIGN AND DATA ANALYSIS IN PSYCHOLOGY II  
 JANUARY, 2016, PARTIAL 2, TYPE B

EXERCISE 1

$$R^2 = \frac{SS_{exp}}{SS_T}$$

①  $R^2_{Y(2.1)} = \frac{14768.229 - 12418.133}{32116.6} = \frac{2350.096}{32116.6} = 0.073$

②  $R^2_{Y(23.1)} = R^2_{Y.123} - R^2_{Y.1} = \frac{15162.396 - 12418.133}{32116.6} = \frac{2744.263}{32116.6} = 0.085$

EXERCISE 2

$$R^2_{Y.123} = \frac{SS_{exp}}{SS_T} = \frac{20.329}{20} = 1$$

the explained sum of squares should be lower than the total sum of squares.  $R^2$  cannot be higher than 1.

$$SS_{exp} = \sum (\hat{Y} - \bar{Y})^2 = (0.824 - 4)^2 + (3.192 - 4)^2 + (5.102 - 4)^2 + (6.894 - 4)^2 + (3.988 - 4)^2 =$$

$$= (-3.176)^2 + (-0.808)^2 + 1.102^2 + 2.894^2 + (-0.012)^2 =$$

$$\bar{Y} = \frac{\sum Y}{N} = \frac{20}{5} = 4$$

$$= 10.087 + 0.653 + 1.214 + 8.375 + 0.0001 = 20.329$$

$$SS_T = \sum (Y - \bar{Y})^2 = (1-4)^2 + (3-4)^2 + (5-4)^2 + (7-4)^2 + (4-4)^2 = (-3)^2 + (-1)^2 + 1^2 + 3^2 + 0^2 = 9 + 1 + 1 + 9 = 20$$

EXERCISE 3

$$\hat{Y} = b_0 + b_1 X_1 + b_2 X_2$$

SCHOOL = 0: PRIVATE  
 1: PUBLIC

$$\hat{Y}_{X_2=0} = 56.607 + 1.884 X_1 + b_2 \cdot 0$$

$$\hat{Y}_{X_2=1} = \boxed{56.607} + 1.884 X_1 + \boxed{b_2 \cdot 1}$$

44.324

$$56.607 + b_2 = 44.324$$

$$b_2 = 44.324 - 56.607$$

$$b_2 = -12.283$$

$$\hat{Y} = 56.607 + 1.884 X_1 - 12.283 X_2$$

# EXERCISE 4

$$r_{y1} = 0.622 \rightarrow r_{y1}^2 = 0.622^2 = 0.387$$

$$r_{y2} = 0.497 \rightarrow r_{y2}^2 = 0.247$$

$$R_{y,12}^2 = \frac{SS_{exp}}{SS_T} = \frac{14768.229}{32116.6} = 0.46$$

$$R_{y(1.2)}^2 = R_{y,12}^2 - r_{y2}^2 = 0.46 - 0.247 = 0.213 \rightarrow R_{y(1.2)} = \sqrt{0.213} = 0.462$$

$$R_{y(2.1)}^2 = R_{y,12}^2 - r_{y1}^2 = 0.46 - 0.387 = 0.073 \rightarrow R_{y(2.1)} = \sqrt{0.073} = 0.27$$

Positive sign because the relationship between each  $X$  and  $Y$  is positive.  
(beta)