Hw2

Tuesday, March 16, 2021 9:56 AM

7.28 a. Define each of the following extra sum of squares:

(1) $SSR(X_5|X_1)$;

$SSR(X_5|X_1) = SSE(X_1) - SSE(X_1, X_5)$
$= SSR(X_1, X_5) - SSR(X_1)$

(2) $SSR(X_3, X_4 | X_1) = SSE(X_1) - SSE(X_1, X_3, X_4)$
$= SSR(X_1, X_3, X_4) - SSR(X_1)$

(3) $SSR(X_4 | X_1, X_2, X_3) = SSE(X_1, X_2, X_3) - SSE(X_1, X_2, X_3, X_4)$

$= SSR(X_1, X_2, X_3, X_4) - SSR(X_1, X_2, X_3)$

(b) For a multiple regression model with five X variables, what is the relevant extra sum of squares for testing whether or not $\beta_5 = 0$?

$SSE(F) \leq SSE(R)$

Full model: $Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5$

Reduced model: $Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4$

$H_0: \beta_5 = 0$ $H_A: \beta_5 \neq 0$

$SSE(R) = SSE(X_1, X_2, X_3, X_4)$ w/ $dF: n-5$

(II) whether or not $\beta_2 = \beta_4 = 0$?

$H_0: \beta_2 = \beta_4 = 0$ $H_A: \beta_2 = \beta_4 \neq 0$

Reduced Model

$Y_i = \beta_0 + \beta_1 X_1 + \beta_3 X_3 + \beta_5 X_5$

$SSE(R) = SSE(X_1, X_3, X_5)$ w/ $dF = n-4$!

7.1 State the number of degrees of freedom that are associated with each of the following extra sum of squares

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(1) $SSR(X_1|X_2) = 1$

(2) $SSR(X_2|X_1, X_3) = 1$

(3) $SSR(X_1, X_2 | X_3, X_4) = 2$

$SSR(X_1|X_3, X_4) + SSR(X_2|X_1, X_3, X_4)$

(4) $SSR(X_1, X_2, X_3 | X_4, X_5) = 3$

$SSR(X_1|X_4, X_5) + SSR(X_2|X_1, X_4, X_5) + SSR(X_3|X_1, X_2, X_4, X_5)$

7.31 The following regression model is being considered in a water resources study:

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i1} X_{i2} + \beta_4 \sqrt{X_{i3}} + \varepsilon_i$$

State the reduced models for testing whether or not:

(1) $\beta_3 = \beta_4 = 0$

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \varepsilon_i$$

(2) $\beta_3 = 0$

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_4 \sqrt{X_{i3}} + \varepsilon_i$$

(3) $\beta_1 = \beta_2 = 5$

$$Y_i = \beta_0 + 5 X_{i1} + 5 X_{i2} + \beta_3 X_{i1} X_{i2} + \beta_4 \sqrt{X_{i4}} + \varepsilon_i$$

(4) $\beta_4 = 7$

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i1} X_{i2} + 7\sqrt{X_{i4}} + \varepsilon_i$$