

WST311 2018: Memorandum for Assignment H (Part 2: Test of Hypotheses)

Answers

1. $H_0: \beta_1 = \beta_2 = \beta_3 = 0$
 H_1 : at least one of the β_i 's differs significantly from 0.
 $\alpha = 0.05$.
 Since $p\text{-value} < 0.0001 < 0.05$, H_0 is rejected.
 There is strong evidence that at least one of the independent variables is significantly related to y .

2. $H_0: \beta_i = 0$
 $H_1: \beta_i \neq 0$ for $i = 1, 2, 3$
 $\alpha = 0.05$.
 Since all the $p\text{-values} < 0.0001 < 0.05$, H_0 is rejected.
 The additional contribution of the term x_i to the regression model, given the other independent variables are already in the model, is significant.
 This is the $p\text{-value}$ for both the $F\text{-test}$ and $t\text{-test}$.

3. $H_0: 2\beta_1 = 2\beta_2 = \beta_3$.
 H_1 : The above equation does not hold for at least one of the equalities
 $\alpha = 0.05$.
 Since $p\text{-value} = 0.1013 > 0.05$, H_0 is not rejected.
 Thus, $2\beta_1$, $2\beta_2$ and β_3 do not differ significantly on the 5% level.

4. The $p\text{-value}$ for the overall model is < 0.0001 indicating that it is significant.
 However, for all the hypothesis
 $H_0: \beta_i = 0$
 $H_1: \beta_i \neq 0$ for $i = 1, 2, \dots, 9$
 the $p\text{-values}$ are > 0.05 indicating that none of the independent variables or functions thereof contribute significant additional information to the regression model if the other independent variables or functions thereof are already in the model.
 This is due to the fact that the variables in the model contribute overlapping information.
 This is an example of multicollinearity.
 The very high values for the VIF (variance inflation factor) also indicate that the independent variables in the model contribute overlapping information and some of the independent variables should be removed from the model.