

Chapter 9

Note: wherever possible, values used in the solutions below are taken directly from the SAS output provided in the text.

1. a i For the model $Y = \beta_0 + \beta_1 X_1 + E$ ($X_1 = \text{AGE}$):
 $H_0: \beta_1 = 0$ vs. $H_A: \beta_1 \neq 0$
Test statistic: $F = 45.18$ Degrees of Freedom (df): 1, 30
 P -value: $P < 0.0001$
At $\alpha = 0.05$, we would reject H_0 and conclude that $\beta_1 \neq 0$; AGE is linearly associated with SBP and, therefore, significantly aids in the prediction of SBP.
 - ii For the model $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + E$ ($X_2 = \text{SMK}$):
 $H_0: \beta_1 = \beta_2 = 0$ vs. $H_A: \beta_1 \neq 0$ and/or $\beta_2 \neq 0$
 $F = 39.16$ df: 2, 29
 $P < 0.0001$
At $\alpha = 0.05$, we would reject H_0 and conclude that $\beta_1 \neq 0$ and/or $\beta_2 \neq 0$; either AGE, or SMK, or both are linearly associated with SBP. At least one of them significantly aids in the prediction of SBP.
 - iii For the model $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + E$ ($X_3 = \text{QUET}$):
 $H_0: \beta_1 = \beta_2 = \beta_3 = 0$ vs. $H_A: \beta_1 \neq 0$ and/or $\beta_2 \neq 0$ and/or $\beta_3 \neq 0$
 $F = 29.71$ df: 3, 28
 $P < 0.0001$
At $\alpha = 0.05$, we would reject H_0 and conclude that $\beta_1 \neq 0$ and/or $\beta_2 \neq 0$ and/or $\beta_3 \neq 0$; either AGE, or SMK, or QUET, or some combination of these predictors is linearly associated with SBP.
- b In Chapter 8, question 1(b), the model containing SMK and AGE was selected as the best model, based on the R^2 values. The overall tests in part (a) above indicate that all three models are statistically significant, making it difficult to distinguish any one model as being “best”. Variables-added-last tests or other model selection strategies (see chapter 16), will be useful in selecting the best model.