

1 Review problem set 3 solutions

Here are solutions to review problem set 3:

12.15 a) $F = 22.28$ b) Yes, $P < .0001$ c) $t = 4.842$ d) $P < .001$, so reject H_0 e) We reject H_0 , so Promo (promotional activities) explains variation in Sales when added to a model containing Devel and Research.

12.16) It is 2 tailed.

12.22) Yes, for $H_0 : \beta_1 = \beta_2 = 0$, $F = 39.34$, $P < .0001$ so we reject H_0 , and conclude that Air Miles and Population help predict Revenue.

12.23) Yes, each of the two partial t tests are significant at $\alpha = .05$, with one $P = .025$ and the other $P < .0001$.

12.24) The confidence intervals are given by: $\hat{\beta} \pm t_{\alpha/2, n-k-1} s.e.(\hat{\beta})$, and $t_{.05, 19} = 1.729$, so for the Air Miles slope we have $.292 \pm (1.729)(.120)$, giving $(.085, .499)$. For the Population slope we have $1.53 \pm (1.729)(.174)$, giving $(1.23, 1.83)$.

12.28 a) $R^2_{REDUCED} = .2049$ b) $R^2_{COMPLETE} = .7973$ c) No, due to the huge difference in R^2 , INCOME alone does not provide an adequate fit.

12.29) To test $H_0 : \beta_{BUSIN} = \beta_{COMPET} = 0$ in the complete model, we use $F = \frac{(2.65 - 0.68)/2}{.0397} = 24.8$. Since $F_{2, 17, .05} = 3.59$, we can reject H_0 at the $\alpha = .05$ level, and conclude that BUSIN and COMPET explain variation in ACCTSIZE when added to a model containing INCOME.

12.56 a) $\hat{y}_i = 102.71 - .83 * PROTEIN - 4.00 * ANTIBIO - 1.38 * SUPPLEM$ b) $\hat{\sigma}_\varepsilon = s_\varepsilon = 1.71$ c) $R^2 = .9007$ d) There is no collinearity problem, as seen in the correlation matrix which shows that all x variables are uncorrelated. This is also reflected in the VIF values of 1 in the printout.

13.53 Check the computer program for details. a) The pattern looks mostly linear, with a slight quadratic effect. b) $\hat{y}_i = -1.54 + .71 * TEMP_i$ c) $\hat{y}_i = 9.18 - .047 * TEMP_i + .012 * TEMP_i^2$, the quadratic pattern looks slightly better. When temperature = 27, the prediction from the linear model is $\hat{y} = 17.63$, and the prediction from the quadratic model is $\hat{y} = 16.36$. Note that in the computer programs the predicted values can be obtained for future values by entering their x values in the data set and counting y as missing. Then the future x values are not used in the regression calculations, but predicted values (and intervals, if requested) are obtained.