Regression Diagnostics in Minitab

Partial Regression Plots

Minitab does not explicitly produce partial regression plots. Fortunately, they can be created easily (if tediously, for large models):

(1) regress Y on all Xs except X_k, saving the residuals

(2) regress X_k on all the other Xs, saving the residuals

(3) plot the residuals from (1) against those from (2)

(4) repeat (1)–(3) for each X.

Nothing is needed from these regressions but the residuals, so you can use the **Results…** window to tell Minitab not to print any output.

Residuals

Minitab produces three forms of residuals (all obtained on the **Storage…** window):

Minitab name	text name	definition
• residuals	residuals	$e_i = Y_i - \hat{Y}_i$
• standardized residuals	studentized residuals	e_i divided by its standard error
• deleted t residuals	studentized deleted residuals	d_i divided by its standard error, where d_i is the deleted residual $d_i = Y_i - \hat{Y}_{i(i)}$

In the **Graphs…** window in the regression procedure, these three kinds of residuals are called Regular, Standardized, and Deleted, respectively. The standardized residuals are what Minitab uses to flag unusually large residuals (any observations with standardized residual greater than 2 in absolute value).

Leverage and Influence

The **Storage…** window of the regression procedure provides three measures of leverage and influence:

- Hi (leverages) [h_{ii} in the text's notation]
- Cook's distance [D_i]
- DFITS [$(DFFITS)_i$]

DFBETAS

Minitab does not explicitly produce *DFBETAS* statistics of influence on particular coefficients. It can be calculated for a particular suspect observation *i* (perhaps flagged by the preceding measures), and coefficient *k*, as follows:

(1) from the regression on the full data set, obtain
   - b_k
   - $(\mathbf{X'X})^{-1}$ *(this is* X'X inverse *in the* **Storage…** *window)*

(2) from the regression without observation *i,* obtain
   - $b_{k(i)}$
   - $MSE_{(i)}$

(3) find c_{kk}, the k^{th} diagonal element of $(\mathbf{X'X})^{-1}$

(4) calculate $(DFBETAS)_{k(i)} = (b_k - b_{k(i)}) \div (\sqrt{MSE_{(i)} c_{kk}})$

Multicollinearity Diagnostics — Variance Inflation Factor

Variance Inflation Factors can be requested on the **Options…** window of the regression procedure (check box for Variance inflation factors, under Display).