

## Methods of Eliminating Multicollinearity

After you diagnose multicollinearity in your model, and you identify the independent variables that are involved in the multicollinearity, your next step is to deal with it. To eliminate or decrease the multicollinearity, you can use several methods.

One method is to remove one or more independent variables, one at a time, from the model. Keep in mind, though, that variables that appear to be redundant still explain some unique variability in the response. So, if you decide to exclude variables, it is a good idea to also explore other ways of eliminating multicollinearity. Another method is to redefine one or more independent variables. For example, you can combine several variables into one representative variable (a composite variable). Or you can convert a variable to a rate. For example, you can divide it by a unit of time.

Remember that multicollinearity leads to inflated standard-error-of-parameter estimates. Thus, biased regression techniques, such as ridge regression or principal component regression, can be used to deal with multicollinearity. Biased regression provides biased parameter estimates but smaller standard errors compared to OLS estimates and standard errors. In PROC REG, you can use the MODEL statement with the RIDGE= option to perform the ridge regression analysis, and the MODEL statement with the PCOMIT= option to perform principal component regression analysis.

To reduce or eliminate multicollinearity in polynomial regression models, you can also center the independent variables (Marquardt, D.W. 1980). This is the method that you learn in this lesson. To center a variable, you subtract a constant from every value of that variable. For example, you can center a variable around its mean or a constant that has some intrinsic meaning for that variable. Centering makes the independent variables orthogonal to the intercept column and removes any multicollinearity with the intercept.