OPTIONAL CD-ROM TOPIC—BACKWARD ELIMINATION

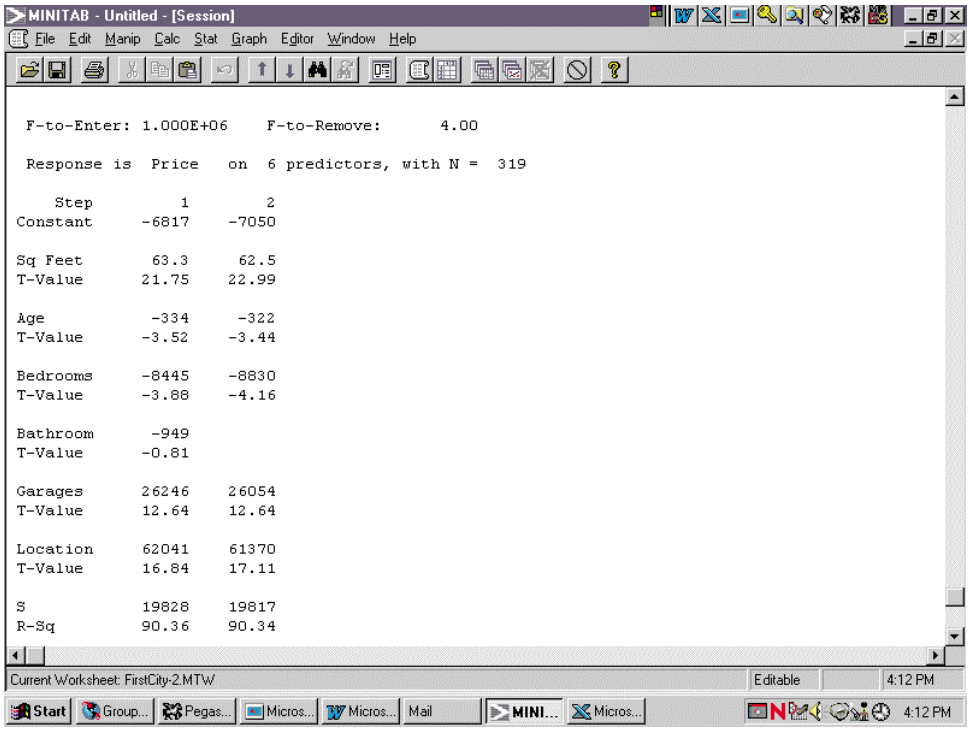
The backward elimination stepwise method begins by developing a full regression model using all independent variables. Then a *t*-test or an *F*-test for significance is performed on each regression coefficient at a specified alpha level. The *F*-test statistic used is the exact square of the *t* test statistic of a regression coefficient described in Section 14-1. Minitab presents *t*-test statistics in the summary of its stepwise procedure even though it requests critical values for the test be furnished as *F*-values. Just remember that the *F* is the exact square of the equivalent *t* statistic. Provided that at least one *t*-value is in the acceptance region (i.e., H_0: $\beta_i = 0$ is accepted), the variable with the *t*-value closest to zero is removed, and another regression model is developed with the remaining independent variables. The value that defines the beginning to the rejection region is known as the **F-to-remove**. The backward elimination continues until all independent variables remaining in the model have *t*-values above a level specified by the decision maker. The models at each step are printed by the computer routine.[1]

The advantage of backward elimination is that the decision maker has the opportunity to look at all the independent variables in the model before removing the variables that are not significant.

First City Real Estate—In the previous examples involving the First City Real Estate Company, we used the full regression approach by bringing into the model all the independent variables. While Excel does not support stepwise regression, Minitab does.[2] Figure 14-2-1 shows the results. In step 1, all variables are in the model. In step 2, the Bathroom variable is eliminated since the *F*-value (*t*-squared) is less than 4.00. The cutoff for removing the variables can be adjusted to any desired level, but Minitab used 4.00 as the default. The resulting regression equation at step 2 is exactly the same as shown earlier in Figure 14-2-1 when we manually removed the Bathroom variable. By eliminating bathrooms in the backward elimination procedure, we are left with five independent variables, all of which are now significant.

FIGURE 14-2-1

Minitab Backward Elimination Output for First City Real Estate



[1]Some software packages allow the user to override the default and force variables from the model even though they may be statistically significant.

[2]You can use Excel to perform stepwise regression in a manual mode by repeating the regression analysis with specified variables eliminated (or added) based upon the usual selection criteria. The PhStat Excel add-in on your CD-ROM can be used to perform stepwise regression. To use Minitab, the *F*-to-Enter option is set at 100000 and all independent variables are also placed in the Enter section in the model specification section.