Economics 671

Solutions: Problem Set #2

(1) Most of the answers are contained in the attached code that performs the requested calcualtions. Note that I have written a separate m-filed called "ols.m" that calculates things like the OLS estimator, standard errors, t-statistics (to be dicussed later), estimates σ^2 and calculates R^2. Details behind these calcualtions can be found within this m-file.

(1a) MATLAB results are provided, and these match the STATA output exactly. I'll focus first on MPG and Zeroto60: For a one unit decline in MPG, expected MSRP declines by about $1,956. Similarly, for a one-second decrease in zero-to-60 time, expected MSRP increases by about $4,073. As for RoadScore, a 10-point increase in score leads to about a $1,800 increase in MSRP. The coefficient on NotReliable turns out to be positive, somewhat surprisingly, but has a large standard error associated with it. Finally, note that about 77 percent of the variation in car MSRP can be explained by variation in the given characteristics.

(1b) That's probably not the right interpretation here. MPG, for example, is strongly correlated with the size of the car: larger cars are generally more expensive yet less fuel efficient, and so part of what is being picked up here is a size effect and not an effect strictly related to fuel efficiency.

(1c) The attached code shows that both procedures produce the same coefficient estimate.

(1d) The predicted price of the A6 is $57,0681. This is about $773 more than the observed MSRP.

(1e) Based on the model in (1a), the predicted price of the Vector is approximately $31,150. So, in terms of a point prediction, this should be within budget. (A standard error calculation would be useful here, but was not requested).

(1f) The coefficient is found to equal one. To see why this should be the case, consider the regression:

$$y = \theta \hat{y} + u.$$

We find

$$\begin{aligned}
\hat{\theta} &= (\hat{y}'\hat{y})^{-1}\hat{y}'y \\
&= (\hat{\beta}'X'X\hat{\beta})^{-1}\hat{\beta}'X'y \\
&= (y'X(X'X)^{-1}(X'X)(X'X)^{-1}X'y)^{-1}y'X(X'X)^{-1}X'y \\
&= (y'X(X'X)^{-1}X'y)^{-1}y'X(X'X)^{-1}X'y \\
&= 1
\end{aligned}$$