ECON4135 Fall 2010

Problem set 2

1. First we look at some useful results

   (a) Show that for some values x_i with $i = 1, \ldots, n$

   $$\sum_{i=1}^{n} (x_i - \bar{x})^2 = \sum_{i=1}^{n} (x_i - \bar{x}) x_i = \sum_{i=1}^{n} (x_i)^2 - n\bar{x}^2 \qquad (1)$$

   where $\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i$

   (b) Show that

   $$\sum_{i=1}^{n} (x_i - \bar{x}) (y_i - \bar{y}) = \sum_{i=1}^{n} (x_i - \bar{x}) y_i = \sum_{i=1}^{n} x_i y_i - n\bar{x}\bar{y} \qquad (2)$$

2. Consider now a standard OLS regression as studied in the lecture. Particularly, $\hat{u}_i = y_i - \hat{\beta}_0 - \hat{\beta}_1 x_i$ denotes the residual

   (a) Show that $\sum \hat{u}_i = 0$

   (b) Show that $\sum \hat{u}_i x_i = 0$

   (c) Use these results to show the "variance decomposition" $TSS = ESS + RSS$.