Econ 444 Elementary Econometrics
Fall 2007
Homework Exercise Solution: 6

(a-c) The solutions are computer files included as excel and word documents.

(d) The results are identical.

(e) $\hat{log(Q_i)} = -0.01 + 0.29log(L_i) + 0.34log(K_i) + 0.37log(Mi)$
$$\qquad\qquad (0.02) \qquad\qquad (0.04) \qquad\qquad (0.06)$$

(f) $\hat{log(Q_i)} = 0.03 + 0.43log(L_i) + 0.57log(K_i)$
$$\qquad\qquad (0.00) \qquad\qquad (0.00)$$

(g) The point estimates in Regression (1) suggest that if labor, capital, and materials inputs were all zero, output would be slightly negative. This makes sense because firms have fixed costs which are independent of output. Given a 1% increase in labor input, we expect a 0.3% increase in output. Given a 1% increase in capital, we expect output to increase by 0.34% increase in ouput. Lastly, we expect a 1% increase in material inputs to increase output by 0.34%.

(h) The regression has $2000 - 1951 + 1 = 50$ observations and it follows that there are $50 - k - 1 = 46$ degrees of freedom. The .95 critical value for 40 dof is 1.684. Our 90% confidence interval is $0.29 \pm 1.684 * 0.02 = (.256, .323)$.

(i) Using the 2-tailed test is as simple as seeing if the t-statistic falls within the 90% confidence interval calculated above. $t = \frac{0.29}{0.023} = 12.61$. Of course this number is very sensitive to the rounding we've done, but it is much bigger than the critical value 1.684 and we **reject the hypothesis that** $\beta_1 = 0$.

(j) The $t_c = 2.021$ so our interval is $0.37 \pm 0.06 * 2.021 = (.249, .491)$.

(k) We have $t = \frac{0.37}{0.063} = 5.87$. This is much larger than the critical value of 2.021, so we **reject the hypothesis that** $\beta_3 = 0$.

(l) $H_A : \beta_3 > 0$ makes more sense. We expect output to increase with material input and certainly not to decrease. The 1-tailed test has $t_c = 1.684$. The t-stat from part (k) is larger than this critical value, thus we reject the hypothesis that $\beta_1 = 0$ and conclude that in fact $\beta > 0$.

(m) For Regression (1), $\bar{R} = 1 - (1 - R^2)\frac{N-1}{N-K-1} = 1 - (1 - 1)\frac{49}{46} = 1$.
For Regression (2), $\bar{R} = 1 - (1 - R^2)\frac{N-1}{N-K-1} = 1 - (1 - 1)\frac{49}{46} = 1$.
Based on the R^2 we are indifferent between the two regressions.

(n) Material belongs in the regression. When materials are excluded coefficients on both labor and capital capture some of its effect.