SOLUTIONS TO EXERCISE 7

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14.2

If the error term is entered additively, the Cobb-Douglas (C-D) model becomes an intrinsically nonlinear regression model. If the error term enters multiplicatively, the model becomes linear in the slope parameters (but not the intercept). But the properties of the error term in this model depend how the error term enters multiplicatively, in the form (14.1.2) or in the form (14.1.3). The difference has different implications for estimation and inference. Traditionally, it has been entered in the form of (14.1.2).

To determine whether the additive or multiplicative form for the error term is appropriate in any given case, one can use a test similar to the J test to choose between the two forms. Also, if we estimate the C-D model both with additive and multiplicative error terms, one can examine the estimated residuals from both these specifications to find out whether the error terms are normally distributed, or whether they are serially correlated, etc.

14.3

In OLS estimation we can obtain explicit, or analytical, solutions to the unknown parameters. In NLLS we cannot obtain such explicit solutions and the estimates must be obtained by an iterative procedure.

14.5

(a). True. See the discussion in Example 14.1.

(b). True. See the discussion in Example 14.1.

15.7

a. The log of the odds in favor of higher murder rate is positively related to population size and the population growth rate but negatively related to the reading quotient. If the population increases by one unit, the odds in favor of higher murder rate goes up by .0014. Other coefficients are to be interpreted a similar fashion.

b. To check which coefficients are significant, just obtain the t statistics by using $t_i = \hat{\beta}_i / se(\hat{\beta}_i)$. Since $t_1 = .0014/.0009 = 1.55$, $t_2 = .0561/.0227 = 2.47$ and $t_3 = -.4050/.1568 = -2.58$, by 95% confident level, we know that the coefficients of C and R are statistically significant.

c. The effect of a unit increase in the reading quotient is about $\exp(.4050) - 1 = 49.93\%$ reduction in the odds ratio.

d. The odds ratio will go up $\exp(.0561) - 1 = 5.770\%$

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15.11

a. Although the results are not uniform, in several cases the logit coefficients, in absolute value, are lower for black matriculants than for all matriculants. In some cases, the difference may not be statistically significant. However, in most cases, the variables have the expected signs.

b. In most cases, they do. For example, The odds ratio of Asian is 1.130 which means the odds of matriculants in the first category graduating from college are 13% higher than those in the latter category (In fact, this is partly true in some in some countries).

c. If we take the t statistics for all matriculants, we may find that all the coefficients are highly statistically significant which is not the case for the black matriculants. We can find the over all significance of the model by the χ^2 values, which is highly significant for all as well as black.