Professor R.L. Oaxaca | Assignment #1
Econ 418 | Fall 2009

Due in class Thursday, September 17
(25 points)

The data for this assignment are contained in both the Excel file 'ceosal2.xls' and the STATA file 'ceosal2.dta' available at http://u.arizona.edu/~rlo. These data pertain to a sample of 177 CEO's in 1990. Be sure to attach the supporting computer print out to the completed assignment, show your work, and make clear where your answers are shown..

The variables of interest for this exercise are *salary* (annual salary in $1,000's) and *sales* (firm sales/revenues in millions).

Some basic STATA commands that might be useful

To obtain the correlation between two variables x and y, type the command **correlate x y.**

To obtain the variances and covariance for two variables x and y, type the command **correlate x y, covariance**.

To obtain the variances and covariance for two estimators $\hat{\beta}_0$ and $\hat{\beta}_1$, type the command **correlate, covariance _coef** immediately following the regression.

1. Some basic statistics.

   a. Let σ_s^2 and σ_r^2 represent the variances of *salary* and *sales*. Write out the statistical formulas for σ_s^2 and σ_r^2 and estimate their values.

   b. Let $\sigma_{sr} = \sigma_{rs}$ represent the covariance between *salary* and *sales*. Write out the statistical formula for σ_{sr} (or σ_{rs}) and estimate its value.

   c. Let $\rho_{sr} = \rho_{rs}$ represent the simple correlation coefficient between *salary* and *sales*. Write out the statistical formula for ρ_{sr} (or ρ_{rs}) and estimate its value.

2. Use OLS to estimate the simple CEO salary model given by $S_i = \beta_0 + \beta_1 R_i + u_i$, $i = 1, ..., 177$ (where S is *salary* and R is *sales*).

   a. According to your estimates, what is the incremental effect on salary from an additional million dollars of sales? Explain.

   b. Write out the formula for the OLS estimator of β_1 and use this formula to verify that you get the same answer as the regression output.

   c. Use the estimated CEO salary model to predict the average salary for a CEO with the sample average sales. How does this predicted value compare with the actual sample mean salary? Explain.

d. Use the OLS estimate of β_1 and the sample mean sales to obtain the OLS estimate of β_0.

e. Use the estimated CEO salary model to obtain the within-sample predicted salaries, $\hat{S}_i$.

(1) Obtain the simple correlation between $\hat{S}_i$ and S_i.

(2) Show how the value of your correlation between $\hat{S}_i$ and S_i relates to the R^2 from the salary regression model you estimated.

f. Write out the statistical formulas for the estimated variance $\left(\hat{\sigma}^2_{\hat{\beta}_1}\right)$ and standard error $\left(\hat{\sigma}_{\hat{\beta}_1}\right)$ for the OLS estimator of β_1 Use these formulas to obtain $\hat{\sigma}^2_{\hat{\beta}_1}$ and $\hat{\sigma}_{\hat{\beta}_1}$.

3. Use OLS to estimate the double-log salary model $\ell n\left(S_i\right) = \beta_0 + \beta_1 \ell n\left(R_i\right) + u_i$, $i = 1, ..., 177$ (where S is *salary* and R is *sales*).

a. According to your estimates, what is the percentage effect on salary from a 10% fall in sales? Explain.

b. How much of the variance in the log of salary can be explained by the model? Explain.

c. Compute the estimated standard error of the random variable $\hat{\beta}_1 - 1$ and the associated 't' value for this random variable if you were testing H_0: $\hat{\beta}_1 - 1 = 0$, H_1: $\hat{\beta}_1 - 1 \neq 0$.

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