

Solution to Problem Set 2 Question 2

Note: The material underlying the problems included in this assignment is covered in Section 3.2-3.4 and 4.1, 4.3 of the textbook. If you had problems answering the questions or you answered them incorrectly and the solutions below do not help, you should review the material there and go see the TA to make sure you understand the concepts and how to apply them.

Question 2

Below you can see the Stata output of a regression estimating a linear relationship between the average math test score (*MathScore*) and the average students-teachers ratio (*STR*) in a district as in the model below:

$$\text{MathScore}_i = \alpha + \beta \text{STR}_i + u_i$$

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. reg math_scr str
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| Source | SS | df | MS | Number of obs | = | 420 |
|----------|------------|-----|------------|---------------|---|--------|
| Model | 5635.62443 | 1 | 5635.62443 | F(1, 418) | = | 16.62 |
| Residual | 141735.097 | 418 | 339.07918 | Prob > F | = | 0.0001 |
| | | | | R-squared | = | 0.0382 |
| | | | | Adj R-squared | = | 0.0359 |
| Total | 147370.722 | 419 | 351.720099 | Root MSE | = | 18.414 |

| math_scr | Coef. | Std. Err. | t | P> t | [95% Conf. Interval] |
|----------|-----------|-----------|-------|-------|----------------------|
| str | -1.938591 | .4755165 | -4.08 | 0.000 | -2.873292 -1.003889 |
| _cons | 691.4174 | 9.382469 | 73.69 | 0.000 | 672.9747 709.8601 |

1. What would be the change in math test score associated with a reduction of the student-teachers ratio of 3.7?

*According to our linear regression model, the predicted change in Math Test Score would be $\beta * \Delta STR = -1.94 * -3.7 = 7.18$*

2. How would you argue whether the effect calculated above is large or small?

One way to scale the effect would be to obtain the standard deviation of math test scores and see which fraction of it the proposed policy change represents.

3. Compute the R^2 of this regression

The R^2 is the ratio between the Explained Sum of Squares (ESS) and the Total Sum of Squares (TSS). In the Stata output table, ESS is referred to as SS “Model” and its value is 5635.42. The TSS is labeled instead “Total” and is 147370.72. Therefore the R^2 is 0.038.

4. Compute the Standard Error of the Regression

The SSR can be computed starting from the Sum of Squared Residuals (SSR) which in the Stata output table is referred to as SS “Residual” and is 141735.1. Hence $SER = \sqrt{\frac{SSR}{N-2}} = \sqrt{\frac{141735.1}{418}} = 18.41$.