WWS 508b
Precept 4

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logarithms

base 10 and base e

Calculate:

$$\log_{10} 10$$

$$\log_e e$$

logarithms

calculator versus Stata

What will I get if I press `log` and 10 on a standard calculator?

logarithms

calculator versus Stata

What will I get if I press `log` and 10 on a standard calculator?

What will I get if I type `disp log(10)` in Stata?

logarithms

calculator versus Stata

What will I get if I press `log` and 10 on a standard calculator?

What will I get if I type `disp log(10)` in Stata?

What about `disp log(exp(1))`?

logarithms

main message

If you see “ln”, you can be sure we are talking about the natural logarithm (meaning log base e). If you see “log” without any base specified, the “default” rule is different depending on the discipline/context. In the social sciences, the default is usually to assume that “log” refers to the natural logarithm (and in Stata, this is what the `log` command gives you).

elasticity

definition of point elasticity

Given a continuously differentiable function $y = f(x)$, the point or instantaneous elasticity of y to x is represented as $\epsilon_{y,x}$ and defined as:

$$\epsilon_{y,x} = \frac{dy/y}{dx/x} = \frac{dy}{dx} \cdot \frac{x}{y} = \frac{x \cdot f'(x)}{f(x)}$$

elasticity

point elasticity applied to Problem Set 3 at $t = 49$

In Question 4 of Problem Set 3, the estimated point or instantaneous elasticities of the 3 models at $t = 49$ are calculated as follows:

Model 1 ($\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 t$):

$$\hat{\epsilon}_{y,t} = \frac{t \cdot \hat{\beta}_1}{\hat{\beta}_0 + \hat{\beta}_1 \cdot t} = \frac{49 \times .0161139}{.6775954 + (.0161139 \times 49)} = .5382$$

elasticity

point elasticity applied to Problem Set 3 at $t = 49$

Model 2 ($\hat{y} = \hat{\alpha}_0 + \hat{\alpha}_1 \log(t)$):

$$\hat{\epsilon}_{y,t} = \frac{t \cdot \hat{\alpha}_1 / t}{\hat{\alpha}_0 + \hat{\alpha}_1 \cdot \log(t} = \frac{49 \times .1855143/49}{.5286975 + (.1855143 \times \log(49))} = .1483$$

elasticity

point elasticity applied to Problem Set 3 at $t = 49$

Model 3 ($\hat{y} = \hat{\gamma}_0 + \hat{\gamma}_1 t^2$):

$$\hat{\epsilon}_{y,t} = \frac{t \cdot 2 \cdot \hat{\gamma}_1 \cdot t}{\hat{\gamma}_0 + \hat{\gamma}_1 \cdot t^2} = \frac{49 \times .0003547 \cdot 49}{.7914385 + (.0003547 \times 49^2)} = 1.0367$$

MLR: observations and parameters

Consider the following model:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + u$$

How many predictor variables do we have?

How many parameters do we have?

MLR: observations and parameters

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$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + u$$

How many predictor variables do we have?

How many parameters do we have?

Can we estimate this model with 2 observations? If we tried to esimtate it using 3 observations, how much of the variation in y would we "explain"?

MLR: Intepreting regression results

Let's say you estimate:

$$\hat{y} = 4 + 2x_1 + 3x_2$$

How would you explain the association between x_1 and y? Between x_2 and y?

What do we need to know to determine if these estimates are statistically significant?

MLR: Intepreting regression results

Let's say you estimate:

$$\hat{y} = 4 + 2x_1 + 2x_1^2 + 3x_2$$

How would you explain the association between x_1 and y?
What is the estimated effect on y of a 1-unit increase in x_1?