

Q-1) Specify the following simple regression models & provide an interpretation for the slope & intercept parameters in each case.

① Level-Level:

$$y = \beta_0 + \beta_1 x + u$$

$$\beta_1 = dy/dx$$

= measures the impact of a marginal change in x on the expected value of y .

β_0 = expected value of y when $x=0$.

② Log-Level:

$$\log y = \beta_0 + \beta_1 x + u$$

β_0 = log of the expected value of y when $x=0$.

e.g. $\log(Y) = 3.03 - 0.2x$

then $\log(Y \text{ when } x=0) = 3.03$

$$\beta_1 = \frac{1}{y} \frac{dy}{dx} = \frac{dy/y}{dx}$$

$$\beta_1 = \frac{dy}{dx} / y$$

(1 unit)

⇒ a marginal change in x changes the expected y by $100 \beta_1 \%$.

clearly, the impact of x on y also depends on the initial value of y .

③

Level - Log:

$$y = \beta_0 + \beta_1 \log(x) + u$$

β_0 = expected value of y when $x = 1$.

$$\beta_1 = x \cdot \frac{dy}{dx} = \frac{dy}{dx/x}$$

⇒ a 1% (percent) change in x leads to a change in the expected value of y by $\beta_1/100$ units. (i.e; 1% of β_1 units)

clearly, the impact of x on y also depends on the initial value of x .

(4)



Log-Log:

~~Log-Log~~

$$\log y = \beta_0 + \beta_1 \log(x) + u$$

$$\frac{1}{y} \frac{dy}{dx} = \beta_1 \frac{1}{x}$$

$$\Rightarrow \boxed{\beta_1 = \frac{dy/y}{dx/x}}$$

\Rightarrow a 1 % (percent) change in x ,
changes the expected value of y by
 β_1 %.

$$\beta_0 = \log(\text{expected value of } y \text{ when } x=1)$$

geometric
mean?