

## Correlation Coefficient

$$r(x, y) = \frac{\text{Cov}(x, y)}{\sigma_x \sigma_y} = \frac{\frac{1}{n} \sum xy - \bar{x} \bar{y}}{\sqrt{\frac{1}{n} \sum x^2 - \bar{x}^2} \sqrt{\frac{1}{n} \sum y^2 - \bar{y}^2}}$$

## Rank Correlation

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)} \quad d_i = x_i - y_i$$

## Regression

$$r(x, y) = \frac{\text{Cov}(x, y)}{\sigma_x \sigma_y} = \frac{\frac{1}{n} \sum xy - \bar{x} \bar{y}}{\sqrt{\frac{1}{n} \sum x^2 - \bar{x}^2} \sqrt{\frac{1}{n} \sum y^2 - \bar{y}^2}}$$

### X on Y

$$x - \bar{x} = b_{xy} (y - \bar{y}) \quad b_{xy} = r \frac{\sigma_x}{\sigma_y}$$

### Y on X

$$y - \bar{y} = r \frac{\sigma_y}{\sigma_x} (x - \bar{x})$$



## Fitting curve

(i) Straight line

$$y = a + bx$$
$$\sum y = \sum a + \sum bx$$
$$\sum xy = a \sum x + b \sum x^2$$

(ii) Power Curve

$$y = ax^b$$

$$\log y = \log a + b \log x$$

$$U = \log y$$

$$A = \log a$$

$$V = \log x$$

$$\sum U = nA + b \sum V \quad - (1)$$

$$\sum UV = A \sum V + b \sum V^2 \quad - (2)$$

(iii) Exponential curve

$$y = ab^x$$

$$\log y = \log a + x \log b$$

$$U = \log y$$

$$U = A + xV$$

$$A = \log a$$

$$\sum U = nA + V \sum x \quad - (1)$$

$$\sum Ux = A \sum x + V \sum x^2 \quad - (2)$$

$$V = \log b$$

(iv) Parabola

$$y = a + bx + cx^2$$



$$\sum y = na + b\sum x + c\sum x^2$$

$$\sum xy = a\sum x + b\sum x^2 + c\sum x^3$$

$$\sum x^2y = a\sum x^2 + b\sum x^3 + c\sum x^4$$