

Correlation and Regression Formula Review

I. Correlation formulas

A. Coefficient of correlation
$$r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{[n(\sum X^2) - (\sum X)^2][n(\sum Y^2) - (\sum Y)^2]}}$$

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B. Coefficient of determination
$$r^2 = (r)^2$$

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C. Coefficient of nondetermination
$$\bar{r}^2 = 1 - r^2$$

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D. The value of t when determining the significance of the coefficient of correlation r
$$t = \frac{r - \rho}{\sqrt{\frac{1 - r^2}{n - 2}}}$$
 and $df = n - 2$

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II. Regression formulas

A. The regression equation
$$\hat{y}_{\cdot x} = a + bx$$

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B. The slope of the regression equation
$$b = \frac{n(\sum XY) - (\sum X)(\sum Y)}{n(\sum X^2) - (\sum X)^2}$$

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C. The y-intercept of the regression equation
$$a = \bar{Y} - b\bar{X} = \frac{\sum y}{n} - b \frac{\sum x}{n}$$

D. The standard error of the estimate
$$S_{y \cdot x} = \sqrt{\frac{\sum (Y - \bar{Y})^2}{n - 2}} = \sqrt{\frac{\sum Y^2 - a(\sum Y) - b(\sum XY)}{n - 2}}$$

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E. An interval estimate for the conditional mean of y for some given value for x

$$\hat{y}_{\cdot x} \pm ts_{y \cdot x} \quad \text{or} \quad \hat{y}_{\cdot x} \pm ts_{y \cdot x} \sqrt{\frac{1}{n} + \frac{(x - \bar{x})^2}{\sum x^2 - \frac{(\sum x)^2}{n}}}$$

Note: An interval estimate for an individual value of y, sales for a recently hired 24-year-old salesperson or grades for your roommate who studied 5 hours, would require adding a 1 under the radical. This makes the interval substantially larger.

$$\hat{y}_{\cdot x} \pm ts_{y \cdot x} \sqrt{1 + \frac{1}{n} + \frac{(x - \bar{x})^2}{\sum x^2 - \frac{(\sum x)^2}{n}}}$$