Discussion 3

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Chapter 10-11

- Age = (20, 21, 22, 30, 40)
- Income = (50, 60, 80, 100, 90)
- What is average income if age is 25?

- Prediction
- -Z score method
- - Regression Line

Review Z score and correlation

- Z score

- Avg Age = 21 year SD Age = 2 year
- Avg Income = 20 $/h SD Income = 5 $/h
- What is your best predicted income if age is 25?

- Correlation

Two ways to calculate the prediction

- Given Avg of x, Avg of y, SD of x , SD of y , and r.

- Method 1:
- 1. Z score for the new point x*. $Z_x = \frac{x* - \text{Avg of x}}{SD_x}$
- 2. Z score value for y* . $Z_y = r \times Z_x$
- 3. The prediction value. $y^* = \text{Avg of y} + Z_y \times SD_y$

Method 1:

- Avg of age = 18, SD of age = 2,
- Avg of income = 20, SD of y =5,
- correlation r= 0.6.

- What is the prediction of income when age is 20?

- What is the prediction of age when income is 30?

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- Regression line
- x is given variable, y is prediction variable
- Estimate the average value for y corresponding to each value of x
- A smoothed version of the graph of averages
- The regression always crosses (Avg of x, Avg of y)

Straight Line

- Slope
- Intercept

Two ways to calculate the prediction

- Given Avg of x, Avg of y, Sd of x , Sd of y , and r.

- Method 2:
- 1. Calculate the slope of the regression line. slope = r $\times \frac{\text{SD}_y}{\text{SD}_x}$
- 2. Calculate the intercept intercept = Avg of y – slope $\times$ Avg of x
- 3. The regression line y= intercept + slope $\times$ x

Method 2:

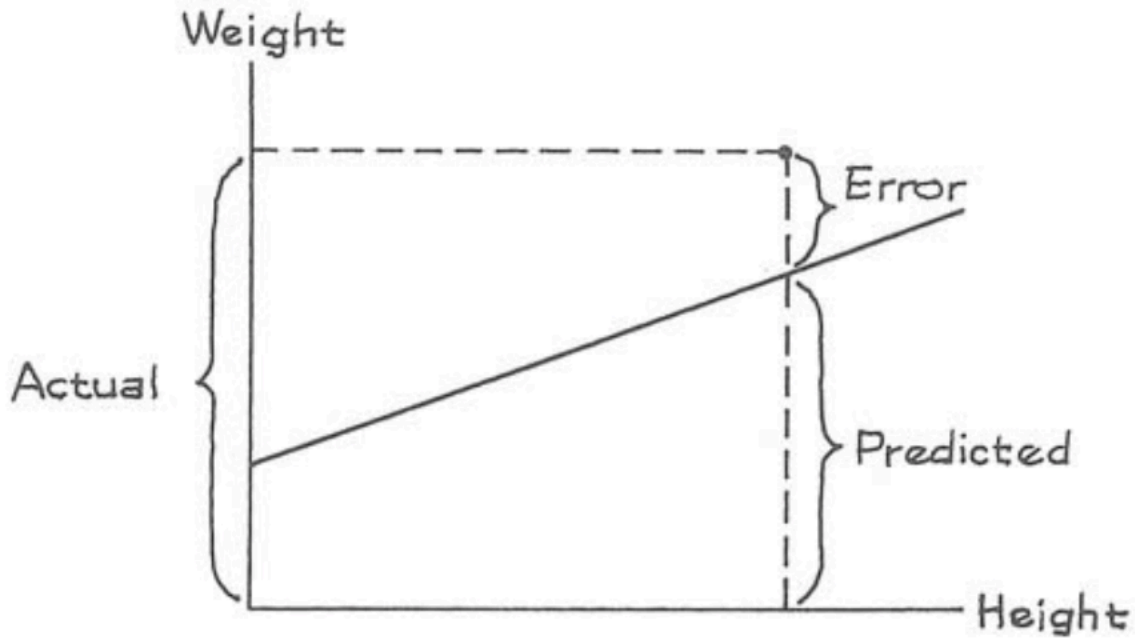
- Avg of age = 18, SD of age = 2,
- Avg of income = 20, SD of y =5,
- correlation r= 0.6.

- What is the prediction of income when age is 20?

- What is the prediction of age when income is 30?

Error / Residuals

Figure 2. Prediction error equals vertical distance from the line.



R.M.S Error

- Root Mean Square error
- R.M.S error = $\sqrt{\frac{(error\ \#1)^2+(error\ \#2)^2+\cdots+(error\ \#n)^2}{n}}$

- Use actual value minus predicted value
- Square the difference
- Mean
- Square root
- R.M.S error = $\sqrt{1-r^2} \times$ SD of y

Quiz

Fill the blank

- x: average age ≈ 50 years, SD ≈ 16 years
  y: average educational level ≈ 13.2 years, SD ≈ 3.0 years,
- r = -0.20

- What is your predicted educational level when age of a person is 58 years old?

- Step:
- 1. Calculate Z score for given variable
- 2. Calculate Z score for prediction variable
- 3. Predicted educational level