

Chapter 3

Descriptive Statistics: Numerical Methods

1 Central Tendency

mean = average

median = the middle position value

mode = the most frequency value(s)

2 Measures of Variation

2.1 Range, Variance and Standard Deviation

- Range= max-min

- Population variance, $\sigma^2 = \frac{\sum(x_i - \bar{x})^2}{N}$
Sample variance, $s^2 = \frac{\sum(x_i - \bar{x})^2}{n - 1}$

- Population standard deviation, $\sigma = \sqrt{\sigma^2}$
Sample standard deviation, $s = \sqrt{s^2}$

2.2 Other Topics

- The empirical rules for normal distribution:

Area over $[\mu - \sigma, \mu + \sigma] = 68.26\%$

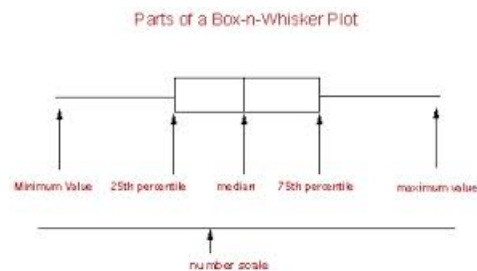
Area over $[\mu - 2\sigma, \mu + 2\sigma] = 95.44\%$

Area over $[\mu - 3\sigma, \mu + 3\sigma] = 99.73\%$

- z score = $\frac{x - \mu}{\sigma}$

3 Box-and-Whiskers Plot

Position of the p^{th} percentile = $\frac{p}{100}(n + 1)$.



$$IQR = Q_3 - Q_1$$

$$\text{Inner fence} = Q_1 - 1.5 \cdot IQR \text{ and } Q_3 + 1.5 \cdot IQR$$

4 Weighted Means and Grouped Data

$$\text{Population mean, } \mu = \frac{\sum f_i M_i}{N}$$

$$\text{Population variance, } \sigma^2 = \frac{\sum f_i (M_i - \bar{x})^2}{N}$$

$$\text{Sample mean, } \bar{x} = \frac{\sum f_i M_i}{n}$$

$$\text{Sample variance, } s^2 = \frac{\sum f_i (M_i - \bar{x})^2}{n - 1}$$